PB85-119006

Facilities Evaluation and Long Term Planning Study for the United States Environmental Protection Agency at Research Triangle Park, North Carolina

(U.S.) Environmental Protection Agency
Research Triangle Park, NC

25 Jul 84

U.S. Department of Commerce
National Technical Information Service
NTIS

BIBLIOGRAPHIC INFORMATION

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25 Jul 84

PERFORMER: Environmental Protection Agency, Research Triangle Park, NC.

Prepared in cooperation with Odell Associates, Inc., Charlotte, NC.

This study identifies space requirements for the United States Environmental Protection Agency in the Research Triangle Park, North Carolina, evaluates the likelihood that the existing facilities will meet those needs and leads ultimately to the conclusion that a new consolidated facility to house most of the EPA activities in the Park is necessary for EPA to accomplish its research priorities in the 1990's.

KEYWORDS: *Facilities, *Research projects, *Environmental protective agency.

Available from the National Technical Information Service, SPRINGFIELD, VA. 22161

PRICE CODE: PC A08/MF A01

PB85-119006

EPA

Facilities Evaluation and Long Term Planning Study for the United States Environmental Protection Agency

at Research Triangle Park North Carolina

July 1984

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

Prepared by:

ODELL Planning Architecture Engineering

FACILITIES EVALUATION AND LONG TERM PLANNING STUDY

FOR

THE UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

AT

RESEARCH TRIANGLE PARK
NORTH CAROLINA

JULY 25, 1984

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EXECUTIVE SUMMARY

This study identifies space requirements for the United States Environmental Protection Agency in the Research Triangle Park, North Carolina, evaluates the likelihood that the existing facilities will meet those needs and leads ultimately to the conclusion that a new consolidated facility to house most of the EPA activities in the Park is necessary for EPA to accomplish its research priorities in the 1990's. The evaluated facilities include the Environmental Research Center, Research Center Annex (Beaunit Building), Beaunit Administration Building, Fluid Modeling Facility (Grand Slam Building), Emissions Measurement Laboratory Facility, storage warehousing facilities and space within the NCHS Building - all in the Research Triangle Park area; and the CAMIO Facility and space within the North Carolina Mutual Building - both in Durham, North Carolina. The Clinical Research Laboratory and Annex, a branch of the Inhalation Toxicology Division of HERL, located in Chapel Hill, North Carolina, will be evaluated in a separate report because this facility will need to remain in Chapel Hill separate from the other EPA activities due to its unique activities and relationship with the medical facilities of the University of North Carolina in Chapel Hill.

This study has been accomplished in three phases. The first phase, which addresses the projected space needs, is based primarily on detailed questionnaires completed by appropriate EPA Personnel. In these questionnaires, the EPA Personnel project what their space, staff, and special construction needs will be for 1990. Approximately 20 percent more space will be needed by 1990 just to correct the present overcrowded conditions and provide for the modest increases requested by the research and computer related functions to meet their anticipated program needs. With the research conducted by EPA becoming more and more sophisticated, new research facilities will be required tailored specifically to the unique requirements of EPA. Furthermore, a consolidation of all EPA activities in the Research Triangle Park is needed to develop better organizational and functional interrelationships among the different EPA components, especially within the Office of Research and Development.

The second phase of this study evaluates the existing EPA facilities to identify problems associated with them and to determine their potential to meet the future needs if these problems can be alleviated. Numerous problems are identified related to serious Building Code violations, hazardous conditions in the research laboratories, outdated and crowded laboratory facilities, inadequate storage, too much dispersement of activities throughout various buildings scattered throughout the Park and restrictions on making changes or improvements in the leased facilities. It has been determined that the Office of Research and

Development cannot carryout all of its research programs in the 1990's in the present facilities.

The third phase of this study identifies alternative ways to meet the 1990 needs. These ways range from remaining in the existing facilities (which is not a viable alternative) to moving into a new consolidated facility. Each alternative is evaluated on the basis of its initial costs and life cycle costs, in accordance with the guidelines established by the Office of Management and Budget. Evaluations of Alternatives are also made based on their timetables for implementation and their potential to satisfy the needs of EPA for 1990 and beyond. The results of this analysis indicate that EPA must have a new facility at the Research Triangle Park by 1990 to carryout its mandated research and development responsibilities, and the most viable alternative, based both on costs and EPA needs, is to construct a government owned consolidated EPA facility, which would ideally be located on the 44-acre tract of land set aside for EPA in the U. S. Public Health Research Park within the Research Triangle Park. The table at the end of this Summary indicates the Alternatives that were evaluated, their associated "present value" costs over a 20-year span and the suggested ranking of Alternatives according to a priority for implementation by EPA. The following report summarizes the findings of all three phases.

This report, prepared as an objective and independent study, elaborates more on the findings of all three phases, and leads Odell Associates Inc. to recommend that steps begin immediately to secure funds for planning and constructing a government-owned consolidated EPA facility within the Research Triangle Park. This alternative not only most completely satisfies the needs of EPA, but also provides the most cost-effective solution for the 20-year span being evaluated. With an estimated two-year period for planning and three-year period for construction, the government needs to move now towards implementing this alternative, if it is to have a new facility ready when all the existing leases expire.

Present Value Cost Analyses

(20 years -7% discount factor)

COST ITEMS	ALTERNATIVE 1 STAY IN EXIST. FACIL., RENEGO. LEASES & LEASE ADDITIONAL SPACE TO MEET PROJECTED NEEDS AT OTHER BLDGS.	ALTERNATIVE 2 CONSTRUCT NEW RESEARCH BLDG. RENOVATE & UPFIT ERC AND RENEGOTIATE LEASE TERMINATE LEASES	ALTERNATIVE 2A CONSTRUCT NEW RESEARCH BLDG. AND PURCHASE ERC. RENOVATE AND UPFIT ERC TERMINATE LEASES AT OTHER BLDGS.	ALTERNATIVE 3 CONSTRUCT NEW GOVT.-OWNED FACILITY TO CONSOL. EPA COMPONENTS	ALTERNATIVE 4 NEW CONSOL. FACIL. BUILT AND LEASED BACK TO EPA	ALTERNATIVE 5 NEW CONSOL. FACIL. WITH LEASE/PURCH. AGREE. WHERE EPA WOULD OWN FACILITY AT EXPIRATION OF LEASE	ALTERNATIVE 5A SAME AS ALT. 5 BUT WITH ALL CONSTRUCTION FINANCING COSTS PAID BY EPA. EPA WOULD AMORTISE COST OF FACIL. OVER 20 YEAR SPAN
LEASE/COST	116,598,550	50,820,931			265,909,400		
LEASE/PURCHASE COST		100,413,00	137,413,000			265,909,400	
DESIGN/BUILD/SITE IMPROVEMENT COSTS				123,012,750			147,488,244
SITE		2,640,000	5,580,000	2,640,000			
UTILITY COST	49,851,449	44,866,991	44,866,991	45,996,288	45,996,288	45,996,288	45,996,288
REPAIRS/MAINTENANCE AND IMPROVEMENTS	48,174,608	41,032,331	41,032,331	38,372,733	38,872,713	38,872,713	38,872,733
TAXES/INSURANCE	2,856,290	11,368,516	11,368,516	11,246,211	11,246,211	11,246,211	11,246,211
UPFIT COST		5,000,000					
MOVING COST		3,583,000	3,583,000	3,583,000	3,583,000	3,583,000	3,583,000
RESIDUAL VALUE		-19,302,996	-27,099,316	-27,099,316		-23,441,010	-23,441,010
TOTAL PRESENT VALUE COST OVER 20 YEARS	**$217,480,897**	**$240,421,773**	**$216,744,522**	**$205,579,289**	**$365,607,612**	**$342,166,602**	**$223,745,466**
SUGGESTED RANKING	NOT RECOMMENDED	**4**	**3**	**1**	**6**	**5**	**2**

SUMMARY OF PROJECTED NEEDS FOR 1990

These evaluations were based on projected needs for the year 1990 - the year most of the leases for the present EPA facilities expire. The projected needs are broken down to the division level within each of the three EPA-RTP components (Office of Administration and Resources Management, Office of Research and Development, Office of Air Quality Planning and Standards), and are identified according to existing and projected space needs for office space, laboratory space, and "other" space needs, number of personnel, special construction requirements, special equipment, spatial relationships and utility requirements. In addition, matrices were developed with the help of EPA to identify desired spatial relationships based on adjacency interconnections and functional interuses. Based on the results of the matrices, bubble diagrams were developed to graphically portray these desired relationships.

The results of the final revised questionnaires and interviews with EPA personnel have been summarized herein in narrative form and with tables indicating space and staff requirements. Additional facility needs are also summarized herein identifying utility needs, building code requirements for EPA facilities and GSA (General Services Administration) requirements for office space.

The following figures represent the existing and projected space requirements in square feet as indicated on the questionnaires and information supplied by EPA. The existing building areas were cross-checked against the available documentation of the existing EPA-RTP facilities. The totals of the existing areas identified on the questionnaires or other EPA-provided information coincide very closely with all other sources, which indicates that most all of the space has been accounted for with a minimum of overlapping information. However, there were some isolated cases where the figures in the questionnaires varied considerably from the other sources used in cross-checking. In most cases, where the discrepancies could not be explained, the figures in the questionnaires were used. Since a fairly high level of confidence has been achieved with this existing information and future needs are projected based on existing information, a fairly high level of confidence can also be assumed for the accuracy of the projected facility needs for 1990.

ORD

Existing Net Area	312,646 S.F.
Existing Gross Area (Calculated)	480,993 S.F.
Projected Net Area	379,115 S.F.
Projected Gross Area	631,858 S.F.
Percent Change	21% Increase in Net Area 31% Increase in Gross Area

OARM

Existing Net Area	169,586 S.F.
Existing Gross Area (Calculated)	226,114 S.F.
Projected Net Area	182,583 S.F.
Projected Gross Area	243,443 S.F.
Percent Change	8% Increase

OAQPS

Existing Net Area	62,340 S.F.
Existing Gross Area (Calculated)	83,120 S.F.
Projected Net Area	62,114 S.F.
Projected Gross Area	82,818 S.F.
Percent Change	1% Decrease

TOTAL EPA-RTP FACILITIES

Existing Net Area	544,572 S.F.
Existing Cross Area (Calculated)	790,227 S.F.
Projected Net Area	623,812 S.F.
Projected Gross Area	958,119 S.F.
Percent Change	14.5% Net Area Increase 21.2% Gross Area Increase

ORD
(CINCINNATI, OHIO LOCATION ONLY)

Existing Net Area	24,840 S.F.
Existing Gross Area (Calculated)	38,215 S.F.
Projected Net Area	30,700 S.F.
Projected Gross Area	47,230 S.F.
Percent Change	23.6% Increase

As indicated above, a 14.5 percent net area increase in facility space requirements has been forecast for 1990. The total figures above do not however include the Inhalation Toxicology Division - Clinical Research Branch in Chapel Hill, North Carolina, the Toxicology and Microbiology Division of HERL in Cincinnati, Ohio, or the Stationary Source Compliance Division of OAQPS in Washington, D.C. The recommendation of this study is that these functions remain where they are due to the nature of their operations.

Projecting these facilities needs for EPA in 1990 is based on certain assumptions about the role and government support of the Environmental Protection Agency as a whole and on assumptions about which EPA programs will be active at that time, which ones will be terminated and what new programs will be implemented. These projected needs are based on the best estimates by EPA personnel. Specific facility requirements required in 1990 to meet these anticipated needs are outlined following the Space and Staff Tables. The Office of Research and Development has also recently released a comprehensive document entitled "Program Needs for a Permanent Facility," dated February, 1984, which very thoroughly addresses the anticipated programs and types of research expected in 1990 and what types of facilities will be required. Overall, the level of research is expected to get increasingly sophisticated, requiring laboratory facilities which are more responsive to the unique needs and special environments necessary to carry out this research.

ORD-EPA
SPACE AND STAFF SUMMARY

FUNCTION	NET LAB SQ. FT.	NET OFFICE SQ. FT.	NET OTHER SQ. FT.	TOTAL NET SQ. FT.	NET TO GROSS %	TOTAL GROSS SQ. FT.	TOTAL STAFF
SSO - SUPPORT SERVICES OFFICE	(440)	(1,320)	(19,037)	*(20,797)	(65%)	(31,995)	(12)
	440	1,320	19,477	* 21,237	60%	35,395	12
HERL - OFFICE OF THE DIRECTOR ADMINISTRATIVE	(3,400)	(5,400)	(1,000)	**(9,800)	(65%)	(15,076)	(34)
	3,800	5,400	1,000	10,200	60%	17,000	37
ANIMAL CARE	(360)	(180)	(16,135)	(16,675)	(65%)	(22,679)	(25)
	600	400	23,660	24,660	60%	41,110	35
INHALATION TOXICOLOGY: ERC-RTP ONLY	(6,450)	(2,640)	(4,490)	(13,535)	(65%)	(20,823)	(74)
	7,365	3,036	7,360	17,761	60%	29,601	79
GENETIC TOXICOLOGY	(7,807)	(3,927)	(2,056)	(13,790)	(65%)	(21,236)	(91)
	8,850	4,680	3,150	16,680	60%	27,800	99
NEUROTOXICOLOGY	(5,975)	(3,410)	(2,246)	(11,631)	(65%)	(17,893)	(84)
	7,470	3,922	3,369	14,761	60%	24,601	92
DEVELOPMENTAL BIOLOGY	(9,488)	(3,795)	(473)	(13,756)	(65%)	(21,184)	(60)
	11,300	4,500	1,620	17,420	60%	29,033	66
BIOMETRY	(0)	(4,180)	(1,210)	(5,390)	(65%)	(8,292)	(29)
	0	5,500	1,500	7,000	60%	11,666	35
EXPERIMENTAL BIOLOGY	(4,840)	(2,310)	(5,023)	(12,173)	(65%)	(18,727)	(38)
	7,200	3,000	8,100	18,300	60%	30,500	42
EMSL - OFFICE OF THE DIRECTOR	(243)	(1,753)	(3,351)	(5,347)	(65%)	(8,226)	(10)
	0	2,053	4,787	6,840	60%	11,400	12
QUALITY ASSURANCE	(5,850)	(5,200)	(6,105)	(17,155)	(65%)	(26,392)	(45)
	7,300	6,500	5,000	18,800	60%	31,333	54
DATA MANAGEMENT ANALYSIS	(0)	(9,598)	(0)	(9,598)	(65%)	(14,766)	(42)
	0	12,150	0	12,150	60%	20,250	55
ENVIRONMENTAL MONITORING	(12,457)	(6,603)	(5,955)	(25,015)	(65%)	(38,484)	(65)
	16,184	8,579	7,237	32,000	60%	53,333	70
IERL - OFFICE OF THE DIRECTOR	(0)	(4,070)	110	(4,180	(65%)	(6,430)	(23)
	0	4,070	110	4,180	60%	6,966	23
TSO	(2,200)	(1,980)	(6,570)	(10,750)	(65%)	(16,538)	(32)
	3,080	3,960	9,120	16,160	60%	26,933	50
ENGINEERING APPLICATIONS	(1,120)	(3,190)	(1,950)	(6,340)	(65%)	(9,753)	(30)
	750	3,960	6,750	11,460	60%	11,460	45
UTIL. & INDUS. PROCESSES	(2,400)	(3,960)	(7,650)	(14,010)	(65%)	(21,533)	(47)
	3,280	3,960	9,050	16,290	60%	27,150	55

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ORD-EPA
SPACE AND STAFF SUMMARY

FUNCTION	NET LAB SQ. FT.	NET OFFICE SQ. FT.	NET OTHER SQ. FT.	TOTAL NET SQ. FT.	NET TO GROSS %	TOTAL GROSS SQ. FT.	TOTAL STAFF
ENERGY ASSMT. & CONTROL	(990)	(3,080)	(7,250)	(11,320)	(65%)	(17,415)	(34)
	1,430	3,190	10,620	15,240	60%	25,400	41
ESRL - OFFICE OF THE DIRECTOR	(0)	(4,232)	(2,848)	(7,080)	(65%)	(10,892)	(23)
	0	4,232	2,848	7,080	60%	11,800	23
ATMOS. CHEM. & PHYSICS	(10,564)	(5,261)	(819)	(16,644)	(65%)	(25,606)	(45)
	10,564	6,601	819	17,984	60%	29,973	52
METEOROLOGY & ASSESSMENT	(12,280)	(9,022)	(8,618)	(29,920)	(65%)	(46,031)	(72)
	12,280	10,425	9,258	31,963	60%	53,271	80
EMISS. MEAS. & CHARAC.	(6,231)	(5,501)	(19,340)	***(31,072)	(65%)	(47,803)	(47)
	7,390	5,794	19,715	***32,899	60%	54,831	55
ECAO - OFFICE OF THE DIRECTOR	(0)	(5,000)	(1,668)	(6,668)	(65%)	(8,890)	(32)
	0	5,300	2,750	8,050	60%	13,416	38
SSO - OVERALL TOTAL	(440)	(1,320)	(19,037)	(20,797)	(65%)	(31,995)	(12)
	440	1,320	19,477	21,237	60%	35,395	12
HERL - OVERALL TOTAL:	(38,275)	(25,842)	(32,633)	(96,750)	(65%)	(148,846)	(435)
Excludes Chapel Hill & Cinn., Ohio Locations	46,585	30,438	49,759	126,782	60%	211,303	485
EMSL - OVERALL TOTAL	(18,550)	(23,154)	(15,411)	(57,115)	(65%)	(87,869)	(162)
	23,484	29,282	17,024	69,790	60%	116,316	191
IERL - OVERALL TOTAL	(6,790)	(16,280)	(23,530)	(46,600)	(65%)	(71,692)	(166)
	8,540	19,140	35,650	63,330	60%	105,550	215
ESRL - OVERALL TOTAL	(29,075)	(24,016)	(31,625)	(84,716)	(65%)	(130,332)	(187)
	30,234	27,052	32,640	89,926	60%	149,876	210
ECAO - OVERALL TOTAL	(0)	(5,000)	(1,668)	(6,668)	(65%)	(10,258)	(32)
	0	5,300	2,750	8,050	60%	13,416	38
TOTAL ORD	(93,130)	(95,612)	(123,904)	(312,646)	(65%)	(480,993)	(994)
	109,283	112,532	157,300	379,115	60%	631,858	1,151
HERL-TOXICOLOGY & MICROBIOLOGY	(15,180)	(7,130)	(2,530)	(24,840)	(65%)	(38,215)	(108)
Cinn.,Ohio Facility Only	18,500	8,200	4,000	30,700	60%	51,166	118

LEGEND:

( )Parenthesis indicates existing.
No parenthesis indicates projected.
* Includes warehouse space (14,712 Sq. Ft. current storage space)
** Includes proposed space to be leased at the Northrop Facility.
*** Includes outdoor storage areas.

OARM-EPA
SPACE AND STAFF SUMMARY

FUNCTION	NET LAB SQ. FT.	NET OFFICE SQ. FT.	NET OTHER SQ. FT.	TOTAL NET SQ. FT.	NET TO GROSS %	TOTAL GROSS SQ. FT.	TOTAL STAFF
OARM - OFFICE OF THE DIRECTOR	(0)	(704)	(0)	(704)	(75%)	(938)	(3)
	0	540	0	540	75%	719	4
OFFICE OF ADMINISTRATION*	(0)	(23,866)	(70,933)	(94,799)	(75%)	(126,398)	(267)
	0	19,035	76,687	95,722	75%	127,630	270
OFFICE OF DATA PROCESSING	(0)	(32,926)	(36,497)	(69,423)	(75%)	(92,563)	(230)
	0	36,045	45,630	81,675	75%	108,899	310
OFFICE OF FINANCIAL MANAGEMENT	(0)	(4,660)	(0)	(4,660)	(75%)	(6,213)	(29)
	0	4,646	0	4,646	75%	6,195	32
TOTAL OARM	(0)	(62,156)	(107,430)	(169,586)	(75%)	(226,114)	(529)
	0	60,266	122,317	182,583	75%	243,443	626

LEGEND:

( ) Parenthesis indicates existing.
No parenthesis indicates projected.
* Office of Administration totals do not include Mercury Warehouse 20,300 Square Feet.

NOTE:

Personnel totals include Contract and Regular EPA Employees and do not reflect just those with office space. There is a projected 444 OARM personnel expected to need office space in 1990 (444 X 135 = 60,266± square feet).

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OAQPS-EPA
SPACE AND STAFF SUMMARY

FUNCTION	NET LAB SQ. FT.	NET OFFICE SQ. FT.	NET OTHER SQ. FT.	TOTAL NET SQ. FT.	NET TO GROSS %	TOTAL GROSS SQ. FT.	TOTAL STAFF
OAQPS - OFFICE OF THE	(0)	(5,229)	(1,100)	(6,329)	(75%)	(8,438)	(12)
DIRECTOR	0	2,295	1,121	3,416	75%	4,554	19
STRATEGIES & AIR STANDARDS	(0)	(9,000)	(0)	(9,000)	(75%)	(11,999)	(70)
	0	11,340	0	11,340	75%	15,119	84
EMISSION STANDARDS &	(7,163)	(13,771)	(0)	(20,934)	(75%)	(27,911)	(88)
ENGINEERING	7,163	15,120	0	22,283	75%	29,710	122
MONITORING & DATA ANALYSIS	(0)	(14,453)	(800)	(15,253)	(75%)	(20,337)	(78)
	0	11,745	800	12,545	75%	16,726	87
CONTROL PROGRAMS	(0)	(6,579)	(3,490)	(10,069)	(75%)	(13,425)	(54)
DEVELOPMENT	0	7,965	3,490	11,455	75%	15,260	64
STATIONARY SOURCE	(0)	(755)	(0)	(755)	(75%)	(1,007)	(5)
COMPLIANCE RTP ONLY. ALSO INCLUDES PTSB OF REGION 4 - FIELD OFFICE	0	675	400	1,075	75%	1,433	5
TOTAL OAQPS	(7,163)	(49,787)	(5,390)	(62,340)	(75%)	(83,120)	(307)
	7,163	49,140	5,811	62,114	75%	82,818	381

LEGEND:
( ) Parenthesis indicates existing.
No parenthesis indicates projected.

SUMMARY OF ORD FUNCTIONS AND FACILITY NEEDS

ENVIRONMENTAL RESEARCH CENTER - RESEARCH TRIANGLE PARK:

The Environmental Research Center is one of the largest multidisciplinary groups of environmental scientists in the world, housing 4 of the 14 laboratories and two additional ORD organizations operated by the Office of Research and Development:

Health Effects Research Laboratory
Environmental Sciences Research Laboratory
Industrial Environmental Research Laboratory
Environmental Monitoring Systems Laboratory
Environmental Criteria and Assessment Office
Support Services Office

Mission of the Laboratories:

Provide EPA with scientific and technological bases for establishment of criteria and standards.

Provide EPA with control technologies to alleviate or deter adverse effects.

Research Program:

Quantify the health effects of human exposure to environmental pollutants.

Develop instruments and methods for measuring pollutants at their source and in the ambient environment.

Develop predictive models for environmental levels of pollutants.

Investigate the chemical and physical transformations that pollutants undergo in air, water and land.

Develop control technologies to reduce emissions from stationary sources.

SUPPORT SERVICES OFFICE:

The Support Services Office (SSO), RTP is a field element of the Office of the Assistant Administrator for Research and Development (AARD). As such, SSO provides to the co-located laboratories and to other ORD elements a range of administrative and management services which are more appropriately provided centrally than by each ORD organization individually. SSO serves as the principal local ORD contact with the Office of Administration. SSO is supervised by a Director who reports to the Senior ORD Official (SORDO) at RTP and to the AARD as the second-line supervisor.

Facility Requirements:

Facility requirements for the Support Services Office consist of general office space in addition to a central ORD copy center, equipment storage for various ORD organizations, centralized conference rooms and a small amount of other specialized rooms.

HEALTH EFFECTS RESEARCH LABORATORY:

HERL provides the health intelligence necessary for determining the need and the establishment of environmental standards. Primary functions of the laboratory include:

Scientific research on the health impact of environmental pollutants.

Development and validation of biological test methods as predators of human effects.

Research to develop ways to more accurately assess human risk from pollutant exposures.

Assistance in the preparation of scientific documents which critically assess what is known about the health effects of pollutants.

General scientific consultation and support to the agency on health effects of pollutants.

The Health Effect Research Laboratory has seven divisions (one presently in Cincinnati, Ohio). They each have special requirements and are all under the supervision of the Office of the Director for HERL.

Facility Requirements:

Facility requirements for the Office of the Director include essentially two separate functions; administration and animal care facilities. In addition to general office space, the Office of the Director controls and maintains the animal care facilities. Animal care requires numerous animal rooms, a cage washing area, refrigerated storage, warehouse space, offices, lockers and laboratories. Some areas require special HVAC, lighting and plumbing needs. Animal care facilities should be in close proximity to only those divisions using animals in their research. This is to avoid unnecessary animal circulation through corridors.

Inhalation Toxicology Division (ITD)

The Toxicology Branch must respond to EPA's increased need for chronic animal inhalation studies and for quantitative extrapolation modeling from animals to man if EPA is to have a more adequate basis for setting National Ambient Air Quality Standards (NAAQS).

Facility Requirements:

The laboratory facility must meet the following minimum standards: 1) adequate hoods for chemical and biological and radioactive uses; 2) high quality temperature and humidity controls; 3) propinquity of lab and office space; 4) full safety features, including provisions for flammable gases; 5) sufficient electrical outlets, 6) "protected" electrical outlets to protect computers from damage from extreme fluctuations and 7) need for hazardous storage and incineration.

In addition to laboratory facilities, Inhalation Toxicology has a variety of other specialized rooms. These include small instrument rooms, animal studies rooms, animal inhalation exposure facility adjacent to the animal facility, rack and cage washing facilities, animal staging area, high hazard rooms, test/pilot laboratory, aerosol test facility, electronics laboratory, and miscellaneous other special rooms. Most of these areas will require specific humidity, HVAC, electrical and plumbing needs. The animal exposure facility will have the latest state-of-the-art features incorporated.

The Clinical Research Branch of ITD has certain needs that require it to be located in close proximity to Chapel Hill School of Medicine and the School of Public Health. Therefore, the facility requirements for this branch of ITD will be studied in an additional report to be issued at a later date.

Genetic Toxicology Division (GTD)

Cell culture encompasses the majority of work alone by Genetic Toxicology.

The future needs of the Genetic Toxicology Division can be met with a facility similar to that recently completed in the K-1 area of the present facility.

Facility Requirements:

Facility requirements for Genetic Toxicology consists of hazard waste storage rooms, animal holding rooms, variety of special laboratories with automated doors, impervious floors, ceiling, etc., with lockers and showers. There is a need for negative air in certain chambers or laboratories and a variety of other HVAC, plumbing, humidity and electrical needs.

Neurotoxicology Division (NTD)

Facility Requirements:

NTD's facility requirements can be broken out into two types: The first (which includes the behavioral and neurophysiological programs) requires provisions for special control of the laboratory environment. Owing to the nature of the research, it is extremely important, for example, to control environmental factors which influence test measurements such as noise level, temperature, humidity, lighting, etc. Generally speaking, modular units should consist of a small animal holding room adjacent to one or two testing rooms and a control room which houses control instruments (e.g., stimulators and recorders, etc.). It is important that the neurophysiology area be vibration free, since vibrations interfere with electrophysiological recordings from the brain.

Other facility needs include short-term housing of animals while they are on experiment; quarantine rooms; central computational facilities housing laboratory ADP equipment; small inhalation facilities; a number of special purpose test rooms. Access to animals is a design feature which should be considered in this space configuration. For the Behavioral Program, facility needs include modular laboratories; high containment rooms; multispecies colony rooms. In the other two research areas, namely neurochemistry and neuropathology, facility needs include standard chemistry laboratories; necessary facilities for handling hazardous materials and conducting assays that use radio-labeled compounds; cold room facilities for storing samples; heavy equipment rooms; a tissue culture facility; incubator room; small overnight animal holding facilities for animals; special rooms are needed to house an electron microscope; an ADP equipment room; tissue culture rooms; slide and specimen storage room; dark room facility; ADP control rooms for collecting and analyzing data.

Specific HVAC, humidity, electrical and noise factors must be an integral part of projected facility requirements for the Neurotoxicology Division.

Developmental Biology Division (DBD)

Facility Requirements:

This division studies the effects of pollutants on biological systems and has many types of laboratories with many different requirements. Some laboratories must be in close proximity to animal care. All of the laboratories require very specific HVAC, humidity, electrical and safety considerations. There is also some general office space and miscellaneous other space with no special requirements.

Biometry Division (BD)

Facility Requirements:

The BD program facility requirements in 1990 should be similar to the current needs. General requirements involve sufficient office space for the biostatisticians, systems analysts, computer specialists, and the technical support portions. Special use needs will consist of adequate space and electrical capacity for a Remote Job Entry (RJE) terminal to the National Computer Center (NCC) mainframe computer system. The room housing this RJE terminal would require limited environmental control such as special air conditioning capability. Professional employee work stations should provide space and facilities for microcomputer usage. There would be programmatic benefit to HERL and EPA if the interaction between the NIEHS biometry program and the BD were strengthened. Such a positive effect would be aided greatly by the existence of an EPA facility in close proximity to the NIEHS campus.

Toxicology and Microbiology Division

Facility Requirements:

This division is presently located in Cincinnati, Ohio. Facility requirements consist of a great deal of specialized laboratory space, general office space and miscellaneous special purpose space. There is a need for special HVAC, humidity, electrical and plumbing considerations in any facility Toxicology and Microbiology occupies.

Experimental Biology Division

Facilities Requirements:

A multidisciplinary research program on physical agents, toxic substances and hazardous wastes requires the following facilities:

General wet laboratories for physiology, biochemistry and toxicology (including laboratories for conducting work with hazardous materials).

General dry laboratories for electrical engineering studies, dosimetry and electronics shop (electronic instrumentation and repair).

Large, high ceiling rooms for Radio Frequency (RF) exposure systems, including 60 Hz exposure systems. A special need will be facilities to conduct studies of human subjects exposed to RF radiation.

Machine shop to support physical agents research program and other programs in HERL. The shop should be in close proximity to loading dock, have large doors to accommodate forklift truck, high ceiling, above average number of electrical circuits (overhead), ventilation sufficient to handle welding fumes and dust, concrete floor which will support 3-ton machines and forklifts, etc.

Storage rooms for electronics parts and large volume consumable laboratory supplies.

Rooms for computerized scientific data processing which require relatively stable temperature and humidity.

It is important to stress the importance of having the environmental monitoring program for physical agents at the same site as the health effects program. Coordination and communication between the two groups would be enhanced and the agency would realize savings by consolidating dual purpose equipment and facilities. Space should be available also for the RF radiation guidance implementation program to assist other Federal agencies. Large rooms designed for electrical and electronic equipment are needed to accommodate the physical agents environmental monitoring program and the RF guidance implementation program. This area should have above average number of electrical circuits, pressurized water lines for cooling RF generators, high ceiling, above average ventilation, etc.

ENVIRONMENTAL SCIENCES RESEARCH LABORATORY:

Mission:

The Environmental Sciences Research Laboratory - Research Triangle Park (ESRL-RTP), North Carolina, conducts an intramural and extramural research program in the physical sciences to detect, define and quantify air pollution and its effects on urban, regional and global atmospheres and the subsequent impact on water quality and land use. The laboratory, under the guidance of the

Director of the U.S. Environmental Protection Agency's Office of Environmental Processes and Effects Research and under the direction of the Director, ESRL, is responsible for planning, implementing and managing research and development programs designed to quantitate the relationships between emissions of pollutants from all types of sources and air quality and atmospheric effects and to uncover and characterize hitherto unidentified air pollution problems. To fulfill this responsibility, ESRL-RTP conducts laboratory and field investigations involving chemistry, physics and meteorology; develops techniques and instrumentation for the measurement and characterization of pollutants in the ambient air and in the emissions from all types of sources; and utilizes ADP systems for compilation and analysis of the data produced by the research. Information from ESRL-TYP programs and from the programs of other Government agencies, private industry and the academic community are integrated by the laboratory to develop the technical basis for air pollution control strategies for various pollutants.

The ESRL is composed of three Divisions and the Office of the Director. The Office of the Director's space requirements consist of the need for office space.

Atmospheric Chemistry and Physics Division

Facility Requirements:

The Atmospheric Chemistry and Physics Division requires dry and wet laboratories with hoods and associated office space, laboratory for smog chamber, parking for mobile laboratories, special laboratory for hazardous/toxic materials or other specialized laboratories, shops and computer room.

Emissions Measurement and Characterization Division

Facility Requirements:

The Emissions Measurement and Characterization Division requires ground level high bay space, fuel storage and dispensing facility, office space, shops, dry and wet laboratories with hoods, exposure chambers and flexibility of design for future rearrangements.

Meteorology and Assessment Division

Facility Requirements:

The Meteorology and Assessment Division requires office space, computer facilities, conference space, specialized library, computer tape library, weather communications and data recorder facility, meteorology outdoor platform and tower, fluid modeling facility (wind tunnels, water channel/towing tank, shops, storage, tanks and related computer facilities), and miscellaneous storage and support functions.

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY:

Mission:

Develop and/or improve monitoring systems for the measurements of air pollutants both in ambient air and stationary sources.

Facility Requirements:

EMSL facility needs include a containment facility for hazardous chemicals, clean rooms for sample and standard preparation, special ground level GC/MS laboratories with uninterruptable power systems, computer rooms, environmental chambers, a quality assurance repository for gas cylinders, a particle laboratory with a wind tunnel and microscopy support laboratory, conventional laboratories, parking with support facilities for mobile monitoring vans, office space and support shops and storage.

INDUSTRIAL ENVIRONMENTAL RESEARCH LABORATORY:

The Industrial Environmental Research Laboratory-RTP determines the multimedia environmental impacts of assigned energy and industrial processes, catalyzes the development of control technologies and process modifications needed to establish and meet standards for air, water, and solid wastes in a timely and cost-effective manner, and supports EPA's regulatory and enforcement programs.

Facilities Requirements:

The Office of the Director for IERL requires general office space and also houses TSO which requires some special laboratories, office space and miscellaneous other space. TSO has special HVAC, electrical and safety requirements (regarding hazardous material).

Energy Applications Division

Facility Requirements:

This division houses the LIMB research and thus has extremely large and heavy equipment. There is some high bay space required to accommodate the current and expected areas of growth. Other special requirements include acoustics, utility needs such as natural gas, electrical, fuel oil, cooling water and compressed air. There is also some general office space and miscellaneous storage, etc.

Utilities and Industrial Processes Division

Facility Requirements:

This division requires high bay space, indoor and outdoor storage for limestone and coal, office space, laboratory space, shops and test areas, lockers and showers, and miscellaneous other space. Some of these areas have specific humidity control, HVAC, electrical and plumbing needs.

Energy Assessment and Control Division

Facility Requirements:

This division has high bay space requirements, isolation facilities, hazardous waste projects with special laboratories, boiler, projects with special laboratories, storage tanks and miscellaneous equipment. There is also some general office space, clean rooms and other miscellaneous space. There are humidity, HVAC, electrical and plumbing needs that have specific functions.

ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE:

Mission:

To comply with the provisions of the Clean Air Act that deal with the preparation of air quality criteria and health assessment documents; provide technical assistance to EPA Program and Regional Offices; serve as a focal point for assessment of results of research performed in the agency.

Facility Requirements:

ECAO facility needs include general office space, a small library, conference rooms, mail/supply/copy rooms, storage, computer terminal room and space for docket files.

SUMMARY OF OTHER ORD FACILITY NEEDS

In addition to actual building requirements, there is also a need for special outdoor space which requires close access to a main facility. Presently Jester Road, adjacent to ERC, contains trailers for equipment storage, chemical storage and miscellaneous storage. In addition, there are some mobile laboratories kept on this property. Future requirements would include concrete pads, utilities, etc., for mobile laboratories; however, a central warehousing facility should ideally replace the storage trailers. An adequate amount of indoor space would also be required in a new facility to handle upfitting and packing of the mobile laboratories needed for field surveys. This indoor space has been included in the projected space needs.

SUMMARY OF OARM FUNCTIONS AND FACILITY NEEDS

OFFICE OF ADMINISTRATION AND RESOURCES MANAGEMENT, RTP:

The Office of Administration and Resources Management, RTP, (OARM, RTP) under the supervision of a Director, provides services to all of the programs and activities at RTP and certain financial and automated data processing services agency-wide. The major functions of the office include personnel services, financial management, procurement through contracts, library and other services, general services (including safety and security, property and supply, printing, distribution, facilities, and other administrative services), and automated data processing systems providing both local RTP and agency-wide services. The Director, OARM, RTP, supervises the Offices of Administration, Financial Management, and Data Processing, RTP.

Facility Requirements:

Facility requirements for the Office of Administration and Resources Management consist of standard administrative office and conference space.

OFFICE OF ADMINISTRATION

Mission:

> Plans and directs a program of administrative support services for the Office of Air Quality Planning and Standards, the National ADP Service Center, and the Office of Research and Development Laboratories located at Research Triangle Park, North Carolina, and the Eastern Environmental Radiation Facility, Montgomery, Alabama. Also, provide property management and financial management assistance to Environmental Protection Agency activities at other assigned locations. The program includes contracts management, personnel management, general services, library services, and program analysis.

Library Services:

> Serves as the central depository for reference materials for EPA programs at RTP, and the central point for these programs to access information systems of other EPA libraries, nearby university libraries, and various data base systems.

Personnel Management Division:

Plans and implements a comprehensive personnel management program encompassing recruitment, placement, and staffing; position classification, position management, and organization planning, equal employment opportunity; training and career development; labor management and employee relations; incentive awards; personnel record systems; and related functions.

Coordinates extensively with top program and agency officials in order to insure the proper integration of these programs into the total program responsibility for efficient and effective personnel management.

Contracts Management Division:

Plans, organizes, and directs the procurement support function of the EPA activities located in the Research Triangle Park area and, as required, those satellite and field organizations amenable to RTP area activities.

Controls redelegation of the procurement authorities within the framework of regulatory requirements.

Provides leadership, guidance, and technical assistance to the assigned EPA programs and the EPA management in the area of procurement.

Assures compliance with the public law and procurement regulations and policy.

Recruits, staffs and budgets for the effective operation of the Contracts Management Division and manages employee career development and training program within the Office of Administration guidelines.

General Services Division:

Provides general support services for the Environmental Protection Agency within the geographic responsibility; Supply Management, Real and Personal Property Management, Communications, Transportation, Publications Distribution, Safety, Security, and Audio-Visual.

Assists in the development of agency-wide policy and procedures relating to support activities.

Provides office services to operating programs as appropriate.

Provides Facilities Management, Modifications, Preventive Maintenance, New Construction, Space Utilization, Safety, and Security Programs.

Facility Requirements:

In addition to general office space, special requirements for space under the direction of the Office of Administration includes an auditorium, library, medical care facilities, food service/cafeteria facilities, conference rooms, central storage warehousing facilities, support facilities for custodial and grounds, audio-visual storage, loading docks/central receiving areas, computer facilities with raised access flooring, reproduction rooms, and the incineration room associated with the ORD operations. Also, as a result of a recent EPA survey there will be a need for a child care facility to accommodate approximately 100 children.

THE OFFICE OF FINANCIAL MANAGEMENT, RTP:

This office, under the supervision of a Director, reporting to the Director, OARM, RTP, provides accounting and fiscal services to programs and activities at RTP and other agency locations. The Office of Financial Management, RTP, receives national program policy and technical guidance from the Office of the Comptroller, OARM (HQ).

Facility Requirements:

Facility requirements for the Office of Financial Management consists of general office space and automatic data processing rooms with raised access computer floors. The computer room could be a shared OARM computer facility.

THE OFFICE OF DATA PROCESSING, RTP:

This office, under the supervision of a Director, reporting to the Director, OARM, RTP, is responsible for the management of information processing resources, including telecommunications in EPA. Subject to national program policy and technical guidance from the Office of Information Resources Management, the Office plans for and acquires or approves all general purpose and scientific computers, associated operating systems, and telecommunications facilities required to meet the needs of EPA programs and regions. Operates and maintains all general purpose computers and local area networks at Headquarters and Research Triangle Park. Provides local support and assistance of ADP operations at all RTP programs and activities. Provides the agency with telecommunications capable to meet agency needs. Develops architectural strategies and procures advanced systems, support equipment, and processing technology to meet agency-wide requirements.

Facility Requirements:

Facility requirements for the Office of Data Processing consist of the main computer rooms with access flooring with special supplemental HVAC systems and backup power and HVAC systems; shipping/receiving/staging area with loading dock; tape storage vault; separate terminal room; vending break areas; Halon fire protection system; tape library adjacent to computer room with small office area and work area; central annunciator station for all alarms; printer room with special HVAC; telecommunications area; special computerized security systems; off-site secured storage; Operations Management Offices; private toilet/shower rooms (these facilities will not be in excess of the Code required facilities, but some toilet facilities should be located ideally within the computer area); general office spaces, some of which should be designed as programmer work stations; conference rooms; Information Center with terminal area and consultation area; training facilities with raised access flooring; terminal room for users and a UPS facility for uninteruptable power. At least 10,000 square feet of office area shall be designed for future computer room expansion.

SUMMARY OF OAQPS FUNCTIONS AND FACILITY NEEDS

Mission:

The Office of Air Quality Planning and Standards is responsible for developing national standards for air quality, emission standards for new stationary sources, and emission standards for hazardous air pollutants; for developing national programs, technical policies, regulations and guidelines to assist states in implementing national standards. The Office is also responsible for developing and maintaining a national air programs data system to include air quality, emissions, and other technical data that will be used by states, regional offices, and EPA in assessing progress toward air quality goals; and for developing compliance programs for stationary sources of air pollution. To accomplish these tasks, OAQPS has established four divisions in Durham and one division in Washington.

OFFICE OF THE DIRECTOR:

Facility Requirements:

General office space, library, copy center, conference rooms.

Strategies and Air Standards Division

National Ambient Air Quality Standards

Air Toxics Program

Pollutant Control Strategies

Cost, Economic, and Benefit Analyses

Facility Requirements:

General office space, conference room, copier room, computer terminal.

Emission Standards and Engineering Division

New Source Performance Standards

National Emission Standards for Hazardous Air Pollutants

Technical Assistance - Control Technology

Emission Testing and Evaluation of Test Methods

Facility Requirements:

General office space, computer facilities with backup power system, conference rooms, confidential files room, docket files, two wet chemistry labs, one instrument lab, one electronics lab, fabrication area, storage, loading dock facility.

Control Programs Development Division

National Overview for Control Programs Under Sections 110 and 111(d) of the Clean Air Act (State Implementation Plans)

Analysis of Alternatives and Guidance for Control Programs

Monitor Progress and Evaluate Control Programs

Provide Training and Assistance for State and Local Control Programs

Facility Requirements:

General office space, conference rooms, computer facility with backup power system, computer terminals, copier room, training rooms.

Stationary Source Compliance Division

Technical Direction for Enforcement Programs

Policy Direction for Compliance with Implementation Plans

Information on Status of Agency Compliance Activities

Guidelines and Technical Assistance

Facility Requirements:

This division is located in Washington, D.C. and would probably not be relocated to the Research Triangle Park.

Monitoring and Data Analysis Division

Acquisition and Analyses of Air Quality and Emissions Data

Provide Air Quality Modeling Techniques to Regional Offices and States

Evaluate Effectiveness of Air Quality Management Programs

Strategies for Monitoring of Toxic Pollutants and Techniques for Identifying Air Quality Impact of Sources

Facility Requirements:

General office space, computer facility with backup power system, computer terminals, computer printers, conference rooms, computer library.

GSA REQUIREMENTS FOR OFFICE WORK SPACE

The General Services Administration has issued temporary regulations on Federal Property Management stipulating a utilization rate for office space equivalent to 135 square feet or less per person. In evaluating the projected space needs of EPA for compliance with these GSA requirements, the following criteria were used as outlined in FPMR Temporary Regulation D-68:

1. "Personnel" shall be based on the peak number of persons to be housed in the office space and shall include Federal personnel, temporaries, part-time, seasonal and contractual employees.
2. "Office Space" shall consist of general purpose office space (either open-office or partitioned space), private corridors, associated conference and training rooms (without special equipment or HVAC), associated library space, associated storage space, lounges (other than toilet areas), reception areas, telephone switchboard rooms, mail rooms, health rooms, and other productive space associated with office areas. Specifically excluded from office space are large storage or warehousing facilities, laboratories, cafeteria, vending areas, auditoriums, shared library facilities, automatic data processing areas, computer rooms, tape vaults, specialized conference and training facilities (with special equipment and HVAC), and other related facilities.
3. The number of personnel indicated for office spaces are based on the projections for 1990 as indicated by EPA on the projected needs questionnaires. The amount of office space was reduced from the original questionnaires to comply with these GSA requirements.

Based on the above criteria, the following figures represent the utilization rates for the projected office spaces within OARM and OAQPS, as defined by GSA:

OARM:

Net office and related functions:

60,226 sf ÷ 444 office personnel = 135 sf/person.

OAQPS:

Net office and related functions:

48,465 sf ÷ 359 office personnel = 135 sf/person.

Conclusion: Projections for office space for both OARM and OAQPS meet the GSA required utilization rate of 135 SF/person. Since existing office space exceeds GSA requirements, there will, in most cases, be an overall reduction in office space between existing and 1990 projections.

BUILDING CODE REQUIREMENTS FOR AN EPA FACILITY

Building Code Requirements:

Building Code: North Carolina State Building Code, 1978 Edition

Occupancy Classifications for an EPA Facility:

Assembly (A) Occupancy: Cafeteria, Auditorium.

Business (B) Occupancy: Administrative Office Space, Computer Center.

Hazardous (H) Occupancy: Laboratory space, special test areas, high-bay space, etc.

Storage (S) Occupancy: Warehouse storage space.

NOTE: Due to the mixed occupancy classifications involved with an EPA facility, fire separations are required between different occupancies according to Article 403.1 of the Building Code, as follows:

Assembly-to-Business: 2-hour separation
Assembly-to-Hazardous: 4-hour separation
Assembly-to-Storage: 4-hour separation
Business-to-Hazardous: 4-hour separation
Business-to-Storage: 4-hour separation
Hazardous-to-Storage: 4-hour separation

Area Limits: Occupancy groups (B) Business. (S) Storage can have unlimited floor areas when complying with the requirements of Article 402.3(e). This article requires the facility to be fully sprinklered, no more than two stories in height, and with a horizontal separation of 60' to any other buildings.

Table 400 of the Building Code indicates the maximum allowable floor areas between fire walls for various types of construction and for various building heights.

For Assembly (A) and Business (B) occupancies, unlimited floor areas can be obtained by using Type I or Type II construction. For Storage (S) occupancies, unlimited floor area can be obtained by using Type I or Type II, fully sprinklered construction. For Hazardous (H) occupancies, the maximum allowable area between fire walls is 11,500 square feet for one-story of Type I or II construction, and less for multiple-story buildings. Building areas exceeding the allowable areas in Table 400 shall be subdivided by 4-hour rated fire walls. The types of construction referenced above stipulate required hourly fire ratings for structural members, floors, walls and roofs of buildings as indicated in Table 600 of the Building Code.

Fire Resistance Requirements:

Vertical Shafts (stairs, elevators, mechanical chases):

4 or more stories - 2-hour rating
Less than 4 stories - 1-hour rating

Walls and Partitions:

Fire walls - 4-hour rating
Mixed occupancy separation - See above
Horizontal exit - 2-hour rating
Exit access corridors (serving occupancy load over 30 people) - 1-hour rating
Structural members, floor construction, roof construction, exterior walls - requirements vary depending on which type of construction is chosen. See Table 600 of Building Code.

Egress Requirements:

Distances to Exits:

Business (B) Occupancy: 150' (50' dead end)
Assembly (A) Occupancy: 150' (0' dead end)
Storage (S) Occupancy: 150' (0' dead end)
Hazardous (H) Occupancy: 75' (0' dead end)

NOTE: The above values may be increased 50 percent for fully sprinklered buildings.

Minimum Number of Exits:

Occupant Load 75 to 500 - 2 exits
501 to 1,000 - 3 exits
Over 1,000 - 4 exits

Occupant Content (for determining exits required):

Assembly (A): 15 net square feet per person
Business (B): 100 gross square feet per person
Hazardous (H): 100 gross square feet per person
Storage (S): 300 gross square feet per person

Capacity of Means of Egress (number of people per unit of exit width - 22"):

Assembly (A):	Level travel - 100 Stairs - 75
Business (B):	Level travel - 100 Stairs - 60
Hazardous (H):	Level travel - 100 Stairs - 60
Storage (S):	Level travel - 60 Stairs - 45

Handicapped Considerations:

All new EPA facilities shall comply with Section IIX of the North Carolina State Building Code, entitled "Making Buildings and Facilities Accessible to and Usable by the Physically Handicapped."

HEATING, AIR CONDITIONING AND VENTILATION SYSTEMS REQUIREMENTS

A. GENERAL REQUIREMENTS:

A central energy plant should serve all buildings to be utilized as major research and development sites. The central energy plant should house boilers, chillers, pumps, and associated equipment to supply steam and chilled water to all site locations. Adequate reserve capacity should be provided to assure the continued supply of required steam and chilled water. The central steam and chilled water system should serve central air handling units located throughout the building complexes. These individual air handling units would meet the space air supply quantity, air filtration, and environmental temperature/humidity requirements.

General office areas and all areas not requiring special air conditioning should be heated and cooled to maintain personnel comfort.

B. SPECIAL REQUIREMENTS:

Smog Chambers - Provide special air conditioning as required.

Balance Rooms - Provide precise control of temperature and humidity.

Major Computer Facilities - Provide redundant air supply units. Provide redundant chilled water capacity. Provide humidity control. Provide monitor alarms.

Small Computer Rooms - Provide self-contained room air conditioning with temperature and humidity control. Provide chilled water coils to back up self-contained cooling capacity.

Rooms housing sensitive test equipment and research devices such as electron microscopes, etc. - Provide adequate filtered air and temperature control.

Laboratory Hoods - Provide exhaust fans at terminal end of exhaust ducts to achieve required face velocity for each hood. Provide filtered and tempered auxiliary air supply to hoods.

Shop Areas - Provide adequate exhaust for fumes and dust.

General Laboratories (Atmospheric Chemistry and Physics Division) - Provide precise temperature and humidity control. Provide adequate filtered air supply.

Hazardous Waste Research Areas - Provide proper air room balance, as required, using hood exhaust system(s). Provide redundant exhaust fans as required.

Laboratory Space (Particulate Technology Branch - Utilities and Industries Processes Division) - Provide high temperature Electrostatic Precipitator, single bag fabric filters, pulse-jet fabric filter, shaker bag house, humidification, and multicompartment fabric filter scrubber.

Exposure Chambers - Provide filtered air to include electrostatic filtration, 99.99 absolute filters, and appropriate filtration methods. The temperature and humidity in each exposure chamber must be independently controlled. Air pressure relationships between chamber and room must be controlled. Subchronic O_3/NO_2 testing may require redundant air handling unit.

Aerosol Technology Lab - Provide dedicated exhaust with 99.99 absolute filtration. Provide supply air with precise control of temperature and humidity.

ITD/Toxicology Areas - Provide two rooms with precise temperature and humidity control. One room must have adjustment between 4° C to 37° C.

Animal Rooms - 100 percent outside air with 99.99 absolute or high efficiency chemical filter with activated charcoal (CBR) air filters. Spaces must have a minimum air exchange quantity. Space conditions must be maintained at 72° F ± 2° F and 50 percent RH ± 5 percent. Redundant cooling and heating capacity must be provided. Areas housing bio-hazardous studies must have filtered exhaust.

Toxic Material Areas (Hazardous Materials Research) - Provide HEPA filters on exhaust air systems.

Dose Preparation and Radioactive Materials Handling - Provide proper filtration of exhaust air.

C. PLUMBING SYSTEMS:

General

Adequate sanitary sewer system shall be provided to handle normal waste water.

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Water

Hot and cold water shall be provided at each sink in "wet" laboratories.

Water shall be provided throughout the facility for general use.

Waste System

Special waste system handling systems to handle animal waste.

Special waste systems for handling biological hazardous wastes to include containment tank.

Provide radioactive waste system with vault as required.

D. SPECIAL SYSTEMS:

Provide high pressure water systems for cleaning, as required.

Provide de-ionized water systems, as required.

Provide breathing air system, as required for areas where contamination, etc. would provide potential danger to people.

Provide gas systems, as required, in laboratory and/or research areas to include natural gas, compressed air, vacuum, nitrogen, zero air.

O.R.D./O.A.Q.P.S./O.A.R.M.
ADJACENCY INTERCONNECTIONS

KEY

X. No communication demand.

1. No necessary direct connection (physically) communication generally by indirect means adequate.

2. Some interconnection desirable due to partial interuse of equipment, people, materials, or animals.

3. Direct interconnection on daily basis of interuse equipment, people, materials, or animals.

		ORD													OAQPS		OARM													
		Office of the Director (HERL)	Administrative	Animal Care	HERL Divisions	Office of the Director (EMSL)	EMSL Divisions	Office of the Director (IERL)	IERL Divisions	Office of the Director (ESRL)	ESRL Divisions	Office of the Director (ECAO)	ECAO Divisions	Support Services Office	Office of the Director (OAQPS)	OAQPS Divisions	Office of the Director (OARM)	Office of the Director (OA)	OA Divisions	Office of Data Processing	Office of Financial Management	Cafeteria	Auditorium	Health Care	Conference	Reception/Lobby	Central Receiving	Central Storage	Building & Grounds Maintenance	Library
ORD	Office of the Director (HERL)	3	3	1	2	1	1	1	1	1	1	2	2	3	1	1	2	2	2	2	1	2	2	2	2	2	1	1	1	2
	Administrative	3	3	1	2	1	1	1	1	1	1	2	2	3	1	1	2	2	2	2	1	2	2	2	2	2	1	1	1	2
	Animal Care	1	1	3	3	X	X	X	X	X	X	X	X	3	X	X	X	X	X	X	X	X	X	X	X	X	2	X	X	[illegible]
	HERL Divisions	2	2	3	3	1	1	1	1	1	1	1	1	3	1	1	2	2	2	1	2	2	2	2	2	2	2	1	2	2
	Office of the Director (EMSL)	1	1	X	1	3	1	1	1	1	1	1	1	3	1	1	2	2	2	2	1	2	2	2	2	1	2	1	1	2
	EMSL Divisions	1	1	X	1	1	3	1	1	1	2	1	1	3	1	1	1	2	2	2	1	2	2	2	2	1	2	1	1	2
	Office of the Director (IERL)	1	1	X	1	1	1	3	3	1	1	1	1	3	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2
	IERL Divisions	1	1	X	1	1	1	3	3	1	1	1	1	3	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1	2
	Office of the Director (ESRL)	1	1	X	1	1	1	1	1	3	3	1	1	3	1	1	2	1	2	2	2	2	2	2	2	2	2	2	1	2
	ESRL Divisions	1	1	X	1	1	2	1	1	3	3	1	1	3	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1	2
	Office of the Director (ECAO)	2	2	X	1	1	1	1	1	1	1	3	3	3	2	2	2	2	2	2	2	2	2	2	3	3	2	2	1	2
	ECAO Divisions	2	2	X	1	1	1	1	1	1	1	3	3	3	2	2	2	2	2	2	2	2	2	2	3	3	2	2	1	2
	Support Services Office	3	3	3	3	3	3	3	3	3	3	3	3	3	1	X	2	2	2	1	1	2	2	2	3	2	1	X	2	2
OAQPS	Office of the Director (OAQPS)	1	1	X	1	1	1	1	1	1	1	2	2	1	3	3	2	1	2	2	2	2	2	2	2	2	2	2	1	2
	OAQPS Divisions	1	1	X	1	1	1	1	1	1	1	2	2	X	3	3	1	1	2	2	2	2	2	2	2	2	2	2	1	2
OARM	Office of the Director (OARM)	2	2	X	1	2	1	2	1	2	1	2	2	2	2	1	3	3	2	3	3	2	2	2	3	3	1	1	1	2
	Office of the Director (OA)	2	2	X	2	2	2	2	2	1	1	2	2	2	1	1	3	3	3	2	3	2	2	2	3	3	2	1	1	2
	OA Divisions	2	2	X	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	2	3	2	2	2	3	3	2	1	1	1
	Office of Data Processing	2	2	X	2	2	2	2	2	2	2	2	2	1	2	2	3	2	2	3	2	2	2	2	3	3	3	3	1	2
	Office of Financial Management	1	1	X	1	1	1	2	2	2	2	2	2	1	2	2	3	3	3	2	3	2	2	2	2	2	1	1	1	1
	Cafeteria	2	2	X	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	X
	Auditorium	2	2	X	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2
	Health Care	2	2	X	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2
	Conference (Central)	2	2	X	2	2	2	2	2	2	2	3	3	3	2	2	3	3	3	3	2	2	2	2	3	3	1	1	1	2
	Reception/Lobby	2	2	X	2	1	1	2	2	2	2	3	3	2	2	2	3	3	3	3	2	2	2	2	3	3	1	1	1	2
	Central Receiving	1	1	2	2	2	2	2	2	2	2	2	2	1	2	2	1	2	2	3	1	2	2	2	1	1	3	3	1	1
	Central Storage (Warehouse)	1	1	X	1	1	1	2	2	2	2	2	2	X	2	2	1	1	1	3	1	2	2	2	1	1	3	3	1	1
	Building & Grounds Maintenance	1	1	X	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	3	1
	Library	2	2	X	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	X	2	2	2	2	1	1	1	3
	TOTALS -	48	48	13	48	42	42	47	46	46	46	53	53	64	46	44	55	56	58	59	51	55	57	57	62	59	52	44	35	5

II-33.

O.R.D
ADJACENCY INTERCONNECTIONS

KEY

X. No communication demand.

1. No necessary direct connection (physically) communication generally by indirect means adequate.

2. Some interconnection desirable due to partial interuse of equipment, people, materials, or animals.

3. Direct interconnection on daily basis of interuse equipment, people, materials, or animals.

	Office of the Director (HERL)	Administrative	Animal Care	Inhalation Toxicology	Genetic Toxicology	Neurotoxicology	Developmental Biology	Biometry	Toxicology & Microbiology	Experimental Biology	Office of the Director (EMSL)	Quality Assurance	Data Management Analysis	Environmental Monitoring	Office of the Director (IERL)	Engineering Applications	Utilities & Industries Processes	Energy Assessment & Control	Office of the Director (ESRL)	Atmospheric Chemistry & Physics	Meterology & Assessment	Emissions Measurement & Char.	Regional Field Studies Office	Office of the Director (ECAO)	Scientific Staff	Technical Services	Support Services Office
Office of the Director (HERL)	3	3	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	3
Administrative	3	3	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	3
Animal Care	2	2	3	3	3	3	3	1	3	3	X	X	X	X	X	1	1	1	X	X	X	X	X	X	X	X	3
Inhalation Toxicology	2	2	3	3	3	3	3	2	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	3
Genetic Toxicology	2	2	3	3	3	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	3
Neurotoxicology	2	2	3	3	2	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	3
Developmental Biology	2	2	3	3	2	2	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	3
Biometry	2	2	1	2	2	2	2	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	3
Toxicology & Microbiology	2	2	3	3	2	2	2	2	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	3
Experimental Biology	2	2	3	3	2	2	2	2	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	3
Office of the Director (EMSL)	1	1	X	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	1	1	1	1	1	2	1	1	3
Quality Assurance	1	1	X	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	3
Data Management Analysis	1	1	X	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	2	2	2	2	1	2	2	1	3
Environmental Monitoring	1	1	X	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	1	2	1	2	2	2	2	1	3
Office of the Director (IERL)	1	1	X	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	1	2	1	1	3
Engineering Applications	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	1	1	1	1	3
Utilities & Industries Processes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	1	2	1	1	3
Energy Assessment & Control	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	1	2	1	1	3
Office of the Director (ESRL)	1	1	X	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	3	3	3	3	3	2	2	1	3
Atmospheric Chemistry & Physics	1	1	X	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	3	3	3	3	3	2	2	1	3
Meterology & Assessment	1	1	X	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	3	3	3	3	3	2	2	1	3
Emissions Measurement & Char.	1	1	X	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	3	3	3	3	3	2	2	1	3
Regional Field Studies Office	1	1	X	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	3	3	3	3	3	2	1	1	3
Office of the Director (ECAO)	2	2	X	2	2	2	2	2	2	2	2	1	2	2	2	1	2	2	2	2	2	2	2	3	3	3	3
Scientific Staff	2	2	X	2	2	2	2	2	2	2	1	1	2	2	1	1	1	1	2	2	2	2	1	3	3	3	3
Technical Services	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3
Support Services Office	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
TOTALS -	43	43	32	48	44	44	44	41	44	44	37	36	42	41	37	36	37	37	41	42	41	42	40	54	49	34	81

O.A.R.M.
ADJACENCY INTERCONNECTIONS

KEY

X.	No communication demand.
1.	No necessary direct connection (physically) communication generally indirect.
2.	Some interconnection desirable due to partial interuse of equipment, people, materials.
3.	Direct interconnection on daily basis of interuse of equipment, people, materials.

		OA																			
	OARM Office of the Director	OA Office of the Director	Administrative	Library	Health Unit	Auditorium	Personnel Management Division	Contracts Management Division	General Services Division	Facilities Management	Cafeteria	Warehouse	Custodial & Grounds	Property Management Branch	Administration	Storage	Incineration	Support Services	Audio-Visual Branch	Office of Data Processing	Office of Financial Management
OARM Office of the Director	3	3	3	2	2	2	2	2	2	2	2	2	1	2	2	2	1	2	2	3	3
OA: OA Office of the Director	3	3	3	2	2	2	3	3	3	2	2	2	1	2	2	2	1	2	2	2	3
Administrative	3	3	3	2	2	2	3	3	3	2	2	2	1	2	2	2	1	2	2	2	3
Library	2	2	2	3	2	2	1	1	1	1	2	2	1	2	2	2	1	2	2	2	1
Health Unit	2	2	2	2	3	2	2	2	2	1	2	2	1	2	2	2	1	2	2	2	2
Auditorium	2	2	2	2	2	3	2	2	2	2	2	2	1	2	2	2	1	2	2	2	2
Personnel Management Division	2	3	3	1	2	2	3	2	2	2	2	2	1	2	2	2	1	2	2	2	2
Contracts Management Division	2	[illegible]	3	1	2	2	2	3	2	2	2	2	1	2	2	2	1	2	2	3	3
General Services Division	2	3	3	1	2	2	2	2	3	3	2	2	3	3	3	2	1	3	3	3	2
Facilities Management	2	2	2	1	1	2	2	2	3	3	2	2	3	2	2	2	1	2	2	3	2
Cafeteria	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	1	2	2	2	2
Warehouse	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	3	1	2	2	2	1
Custodial & Grounds	1	1	1	1	1	1	1	1	3	3	2	2	3	2	2	3	1	2	2	1	1
Property Management Branch	2	2	2	2	2	2	2	2	3	2	2	2	2	3	3	2	1	2	2	2	2
Administration	2	2	2	2	2	2	2	2	3	2	2	2	2	3	3	2	1	2	2	2	2
Storage	2	2	2	2	2	2	2	2	2	2	2	3	3	2	2	3	1	2	2	2	1
Incineration	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	2	1	X
Support Services	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	3	2	2	2
Audio-Visual Branch	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	3	1	1
Office of Data Processing	3	2	2	2	2	2	2	3	3	3	2	2	1	2	2	2	1	2	1	3	2
Office of Financial Management	3	3	3	1	2	2	2	3	2	2	2	1	1	2	2	1	X	2	1	2	3
TOTALS -	45	47	47	36	40	41	42	44	50	43	42	42	35	44	44	43	24	44	42	44	40

O.A.Q.P.S.
ADJACENCY INTERCONNECTIONS

KEY

X. No communication demand.

1. No necessary direct connection (physically) communication generally indirect.

2. Some interconnection desirable due to partial interuse of equipment, people, materials.

3. Direct interconnection on daily basis of interuse of equipment, people, materials.

	OAQPS Office of the Director	Strategies & Air Standards	Emission Standards & Engineering	Monitoring & Data Analysis	Control Programs Development	Stationary Source Compliance (in Washington, D.C.)
OAQPS Office of the Director	3	3	3	3	3	1
Strategies & Air Standards	3	3	3	3	3	1
Emission Standards & Engineering	3	3	3	3	3	1
Monitoring & Data Analysis	3	3	3	3	3	1
Control Programs Development	3	3	3	3	3	1
Stationary Source Compliance (in Washington, D.C.)	1	1	1	1	1	3
TOTALS -	16	16	16	16	16	8

O.R.D
FUNCTIONAL INTERUSES

	HERL									EMSL				SSO	IERL					ESRL					ECAO		
	Office of the Director	Administration	Animal Care	Genetic Toxicology	Neurotoxicology	Developmental Biology	Biometry	Toxicology & Microbiology	Experimental Biology	Office of the Director	Quality Assurance	Data Management Analysis	Environmental Monitoring	Support Services Office	Office of the Director	TSO	Engineering Applications	Utilities & Industries Processes	Energy Assessment & Control	Office of the Director	Atmospheric Chemistry & Physics	Meterology & Assessment	Emissions Measurement & Char.	Regional Field Studies Office	Office of the Director	Scientific Staff	Technical Services
High Bay Space	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1	2	3	3	3	1	3	3	3	1	1	1	1
Heavy Equipment	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	1	2	3	3	1	1	1	1
Special Equipment	1	1	3	3	3	3	1	3	3	1	3	3	3	2	1	3	3	3	3	1	3	3	3	1	3	2	3
High Hazard Flammable	1	1	1	3	3	3	1	3	3	1	3	1	3	1	1	3	3	3	3	1	3	2	3	1	1	1	1
Radiological	1	1	1	3	3	3	1	3	3	1	1	1	2	2	1	3	2	2	2	1	3	3	3	1	1	1	1
Toxic	1	1	3	3	3	3	1	3	3	1	3	1	3	2	1	3	3	3	3	1	3	3	3	1	1	1	1
Limited Access	1	1	3	3	3	3	1	3	3	1	3	3	3	1	1	3	2	2	3	1	1	1	1	1	1	1	2
Public Access	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1	1	1	2	2	2	1
Vehic. (Service) Access	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	3	2	3	1	1	1	1
Loading Dock	1	1	3	1	1	1	1	1	1	1	3	1	2	1	1	2	2	2	2	1	2	2	3	1	1	1	1
Motor Pool	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1
Postal Services (Cen. Mail Rm.)	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	2	2	2	2	2	1	1	1	2	3	3	3
Incineration	1	1	3	2	2	2	1	2	2	1	1	1	1	2	1	2	2	2	2	1	2	1	2	1	1	1	1
Central Machine Shop	1	1	1	2	2	2	1	2	2	1	1	1	2	1	1	2	2	2	2	1	2	2	2	1	1	1	1
Central Electronics Shop	1	1	1	2	2	2	1	2	2	1	1	1	2	1	1	2	2	2	2	1	2	2	2	1	1	1	1
Central Glass Washing	1	1	3	3	3	3	1	3	3	1	2	1	2	1	1	2	2	2	2	1	2	1	1	1	1	1	1
Programmed Equipment Storage	1	1	3	2	2	2	1	2	2	1	2	2	2	1	2	2	2	2	2	1	3	3	3	1	1	1	2
Chemical Storage	1	1	1	2	2	2	1	2	2	1	2	1	2	1	1	2	2	2	2	1	2	1	1	1	1	1	1
Paper & Misc. Storage	1	1	3	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	3
Central Animal Handling	1	1	3	3	3	3	1	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Central O.R.D. Computer Rm.	1	1	1	1	1	1	3	1	1	1	1	2	1	1	2	2	2	2	2	2	1	2	1	2	2	2	2
Exposure Chambers	1	1	3	3	3	3	1	3	3	1	1	1	1	1	1	2	1	3	2	1	3	3	3	1	1	1	1
Total Utility Access	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	1	3	3	3	1	1	1	1
Gas Storage (Central)	1	1	1	2	2	2	1	2	2	1	3	1	2	1	1	2	2	3	3	1	3	2	2	1	1	1	1
Web Laboratory	1	1	3	3	3	3	1	3	3	1	3	1	3	2	1	3	3	3	3	1	3	1	3	1	1	1	1
Special Purpose Lab.	1	1	3	3	3	3	1	3	3	1	3	1	3	1	1	3	3	3	3	1	3	3	3	1	1	1	1
TOTALS -	27	27	56	53	53	53	29	53	55	26	47	33	47	33	32	60	58	61	61	30	58	52	57	30	32	31	35

KEY

1. Little use or no interrelationship.
2. Definite use with time factor of connection not the prime requirement.
3. Integral, high intensity use or accessibility on a steady basis.

II-37.

O.A.R.M.-R.T.P.
FUNCTIONAL INTERUSES

KEY

1. Little use or no interrelationship.
2. Definite use with time factor of connection not the prime requirement.
3. Integral, high intensity use or accessibility on a steady basis.

	OARM	OA																	OFM	ODP
	Office of the Director - OARM	Office of the Director	Administration	Library	Health Unit	Auditorium	Personnel Management Division	Contracts Management Division	General Services Division	Facilities Management Branch	Cafeteria	Warehouse	Custodial & Grounds	Property Mgmt. Branch (Admin.)	Storage (Programmed)	Incineration	Support Services Branch	Audio-Visual Branch	Office of Financial Management	Office of Data Processing
Control & Identification	3	3	3	1	1	3	3	3	3	2	2	3	1	2	3	1	2	2	2	3
Safety Operations	2	2	2	1	1	1	1	1	2	3	2	2	1	1	2	1	1	1	1	2
Loading Dock	1	1	1	1	1	1	1	1	2	2	2	3	1	2	3	1	2	1	1	3
Limited Access	2	2	2	1	1	1	1	1	1	1	2	3	1	1	3	1	1	1	1	3
Public Access	3	3	3	3	2	3	3	3	3	3	2	1	1	3	1	1	3	3	2	3
Vehic. (Service) Access	2	2	2	2	1	2	2	3	2	2	2	3	1	2	3	1	2	2	1	3
Motor Pool	3	3	3	2	1	2	2	2	3	2	2	2	1	2	2	1	2	1	2	2
Postal Services (Cen. Mail Rm.)	2	2	2	2	2	1	2	2	2	1	2	1	1	1	1	1	3	1	2	2
Incineration	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1
Shop Services	1	1	1	1	1	1	1	1	3	2	2	3	1	1	3	1	1	1	1	3
Central Machine Shop	1	1	1	1	1	1	1	1	2	2	2	3	1	1	3	1	1	1	1	2
Central Electronics Shop	1	1	1	2	1	1	1	1	2	2	2	2	1	1	2	1	2	2	1	3
Programmed Equipment Storage	1	1	1	1	1	2	1	1	2	2	2	3	1	3	3	1	2	2	1	3
Chemical Storage	1	1	1	1	1	1	1	1	2	1	2	1	1	3	1	1	1	1	1	1
Paper & Misc. Storage	2	2	2	3	1	1	1	1	2	2	2	3	1	3	3	1	2	2	2	3
Central OARM Computer Rm.	2	3	2	1	1	1	3	3	3	3	2	1	1	2	1	1	2	1	3	2
Material Handling	2	2	2	2	1	1	1	2	2	2	2	3	1	3	3	1	2	1	1	3
Reproduction	3	3	2	2	1	2	3	3	3	2	2	1	1	2	1	1	3	2	3	2
Communications Center	2	1	1	1	1	1	1	1	3	2	2	1	1	1	1	1	3	1	1	3
Central Receiving	2	2	2	2	1	1	1	3	2	2	2	3	1	3	3	1	2	1	1	3
Maintenance & Grounds	1	1	1	1	1	1	1	1	3	2	2	1	3	1	1	1	1	1	1	1
Employee Facilities	2	2	2	2	2	2	2	2	3	2	2	2	1	2	2	1	2	2	2	3
Food Facilities	2	2	2	2	2	2	2	2	3	2	2	2	1	2	2	1	2	2	2	2
Recreation Facilities	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1	2	2	1	2
Planning & Fac. Design	2	2	2	1	1	1	1	1	3	3	2	1	1	1	1	1	2	1	1	2
Conference Space	3	3	3	2	1	3	3	3	3	2	2	1	1	2	1	1	1	3	2	3
Central Power Plant	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	2
Employee Medical Facility	2	2	2	2	3	2	2	2	2	2	2	2	1	2	2	1	2	2	2	2
Warehousing	2	2	2	1	1	1	1	1	2	2	2	3	1	3	3	1	1	1	1	3
Training Rooms	1	1	1	1	1	1	2	2	2	1	2	1	1	1	1	1	1	3	1	3
TOTALS -	55	55	53	46	37	44	48	52	69	59	60	59	30	55	59	30	53	46	43	73

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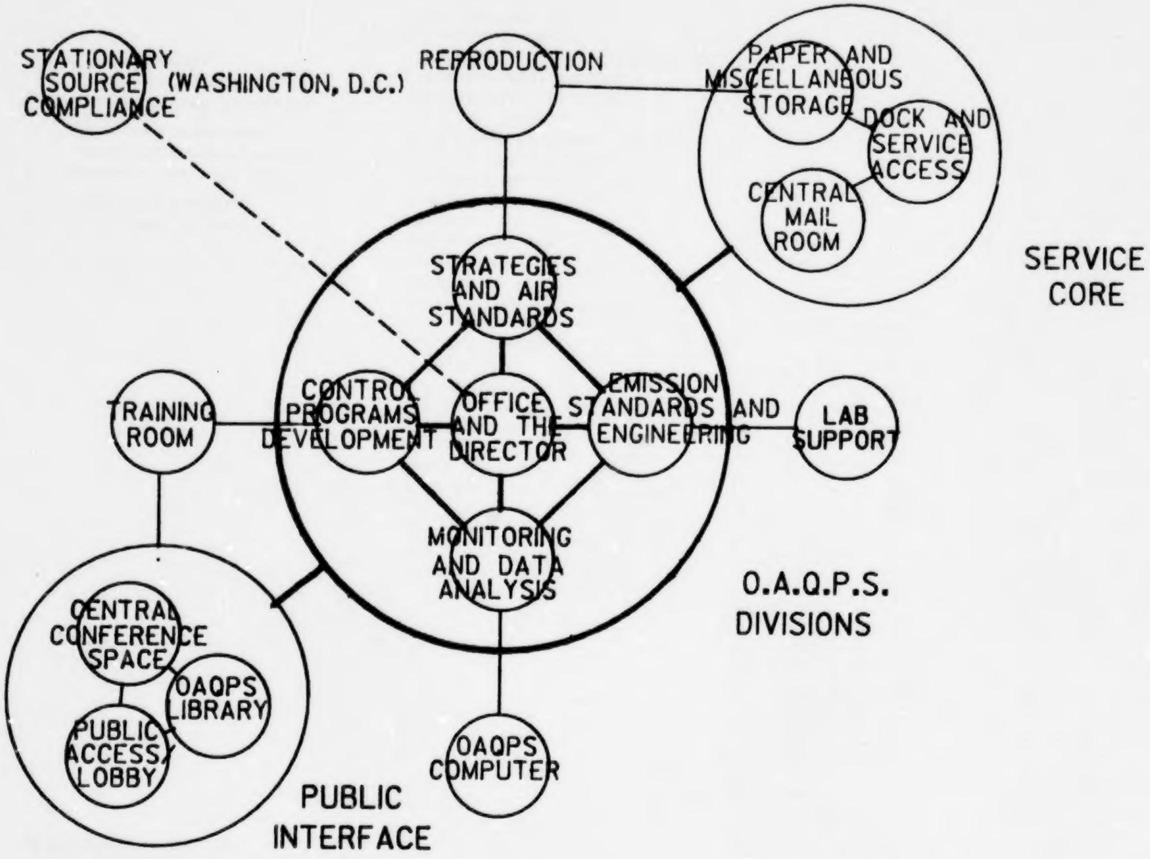
O.A.Q.P.S.
FUNCTIONAL INTERUSES

	Office of the Director	Strategies & Air Standards	Emissions Standards & Engineering	Monitoring & Data Analysis	Control Programs Development	Stationary Source Compliance
Library	1	2	2	2	2	2
Reproduction	3	3	3	3	3	3
Training Rooms	1	1	1	1	3	1
Conference Rooms	3	3	3	3	3	3
High Bay Space	1	1	1	1	1	1
Heavy Equipment	1	1	1	1	1	1
Special Equipment	1	1	1	1	1	1
High Hazard	1	1	1	1	1	1
Flammable	1	1	1	1	1	1
Radiological	1	1	1	1	1	1
Toxic	1	1	1	1	1	1
Limited Access	1	1	1	1	1	1
Public Access	3	3	3	3	3	3
Vehic. (Service) Access	2	2	3	2	3	2
Loading Dock	2	2	3	2	3	2
Motor Pool	2	2	2	2	2	2
Postal Services	2	2	2	2	2	2
Incineration	1	1	1	1	1	1
Central Machine Shop	1	1	2	1	1	1
Central Electronics Shop	1	1	2	1	1	1
Central Glass Washing	1	1	2	1	1	1
Programmed Equipment Storage	1	1	2	1	2	1
Chemical Storage	1	1	2	1	1	1
Paper & Misc. Storage	2	2	2	2	2	2
Central Animal Handling	1	1	1	1	1	1
Central O.A.Q.P.S. Computer Rm.	1	1	1	3	1	1
Exposure Chambers	1	1	1	1	1	1
Total Utility Access	1	1	3	1	1	1
Gas Storage	1	1	2	1	1	1
Wet Laboratory	1	1	3	1	1	1
Special Purpose Laboratory	1	1	3	1	1	1
TOTALS -	42	43	57	45	48	43

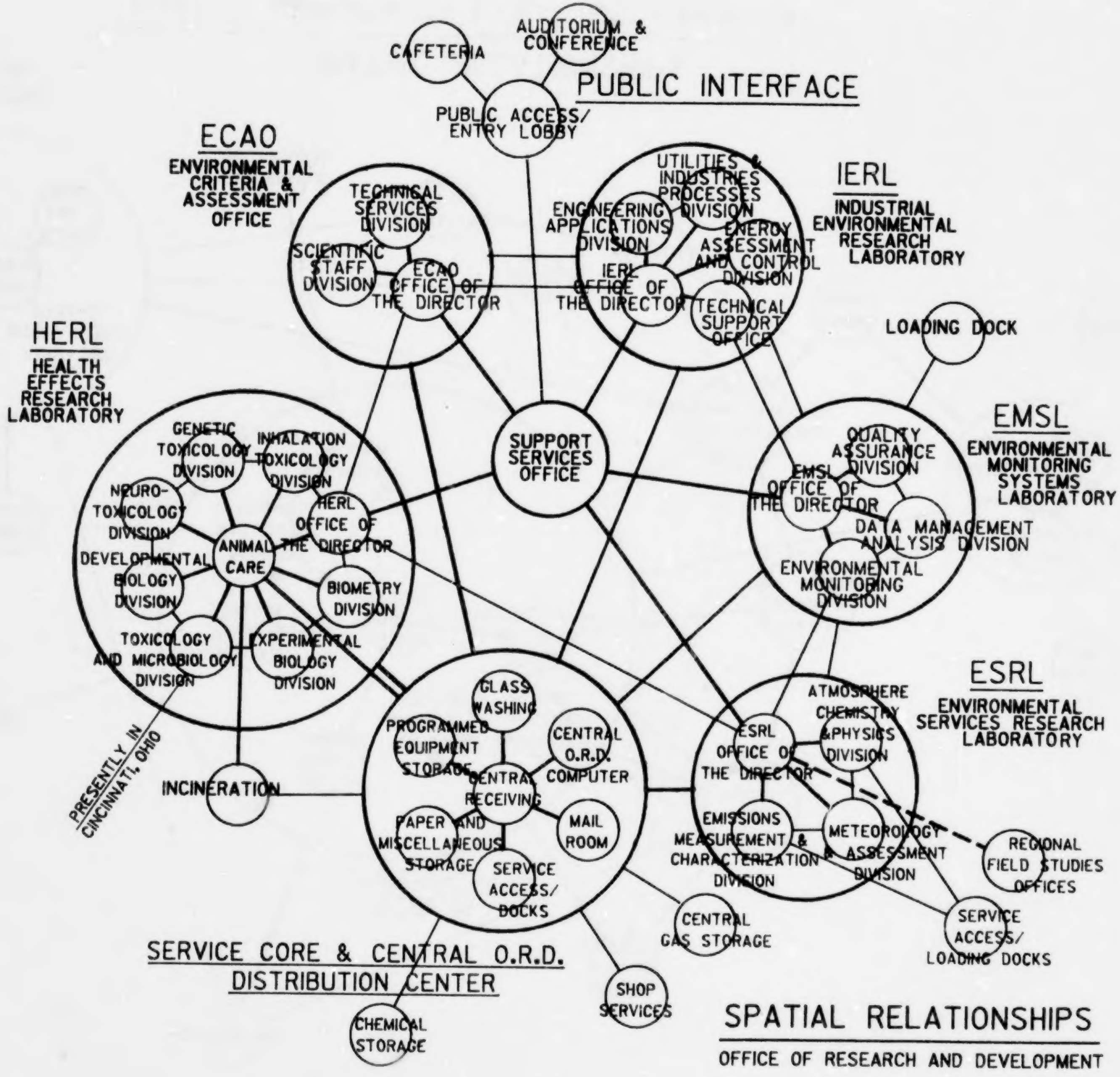
KEY

1. Little use or no interrelationship.
2. Definite use with time factor of connection not the prime requirement.
3. Integral, high intensity use or accessibility on a steady basis.


STATIONARY SOURCE COMPLIANCE (WASHINGTON, D.C.)
REPRODUCTION
PAPER AND MISCELLANEOUS STORAGE
DOCK AND SERVICE ACCESS
CENTRAL MAIL ROOM
SERVICE CORE
STRATEGIES AND AIR STANDARDS
CONTROL PROGRAMS DEVELOPMENT
OFFICE AND THE DIRECTOR
EMISSION STANDARDS AND ENGINEERING
LAB SUPPORT
TRAINING ROOM
MONITORING AND DATA ANALYSIS
O.A.Q.P.S. DIVISIONS
CENTRAL CONFERENCE SPACE
OAQPS LIBRARY
PUBLIC ACCESS/LOBBY
PUBLIC INTERFACE
OAQPS COMPUTER

SPATIAL RELATIONSHIPS

OFFICE OF AIR QUALITY PLANNING & STANDARDS (O.A.Q.P.S.)


CAFETERIA
AUDITORIUM & CONFERENCE
PUBLIC INTERFACE
PUBLIC ACCESS/ ENTRY LOBBY
ECAO
ENVIRONMENTAL CRITERIA & ASSESSMENT OFFICE
TECHNICAL SERVICES DIVISION
SCIENTIFIC STAFF DIVISION
ECAO OFFICE OF THE DIRECTOR
IERL
INDUSTRIAL ENVIRONMENTAL RESEARCH LABORATORY
UTILITIES & INDUSTRIES PROCESSES DIVISION
ENGINEERING APPLICATIONS DIVISION
ENERGY ASSESSMENT AND CONTROL DIVISION
IERL OFFICE OF THE DIRECTOR
TECHNICAL SUPPORT OFFICE
LOADING DOCK
HERL
HEALTH EFFECTS RESEARCH LABORATORY
GENETIC TOXICOLOGY DIVISION
INHALATION TOXICOLOGY DIVISION
NEURO-TOXICOLOGY DIVISION
HERL OFFICE OF THE DIRECTOR
ANIMAL CARE
DEVELOPMENTAL BIOLOGY DIVISION
BIOMETRY DIVISION
TOXICOLOGY AND MICROBIOLOGY DIVISION
EXPERIMENTAL BIOLOGY DIVISION
PRESENTLY IN CINCINNATI, OHIO
SUPPORT SERVICES OFFICE
EMSL
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
QUALITY ASSURANCE DIVISION
EMSL OFFICE OF THE DIRECTOR
DATA MANAGEMENT ANALYSIS DIVISION
ENVIRONMENTAL MONITORING DIVISION
ESRL
ENVIRONMENTAL SERVICES RESEARCH LABORATORY
ATMOSPHERE CHEMISTRY &PHYSICS DIVISION
ESRL OFFICE OF THE DIRECTOR
EMISSIONS MEASUREMENT & CHARACTERIZATION DIVISION
METEOROLOGY & ASSESSMENT DIVISION
REGIONAL FIELD STUDIES OFFICES
SERVICE ACCESS/ LOADING DOCKS
INCINERATION
GLASS WASHING
PROGRAMMED EQUIPMENT STORAGE
CENTRAL O.R.D. COMPUTER
CENTRAL RECEIVING
PAPER AND MISCELLANEOUS STORAGE
MAIL ROOM
SERVICE ACCESS/ DOCKS
CENTRAL GAS STORAGE
SHOP SERVICES
CHEMICAL STORAGE
SERVICE CORE & CENTRAL O.R.D. DISTRIBUTION CENTER

SPATIAL RELATIONSHIPS

OFFICE OF RESEARCH AND DEVELOPMENT

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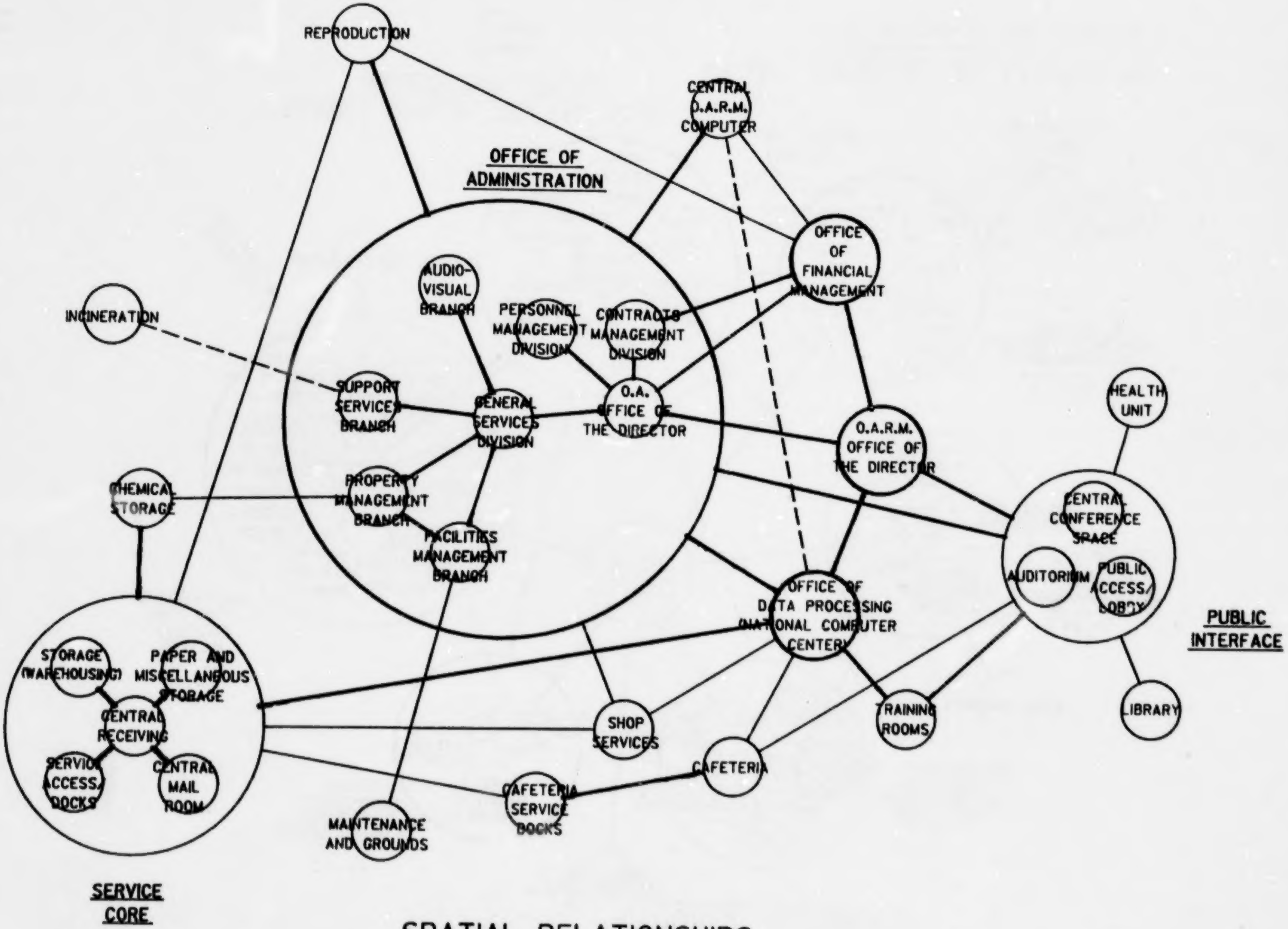
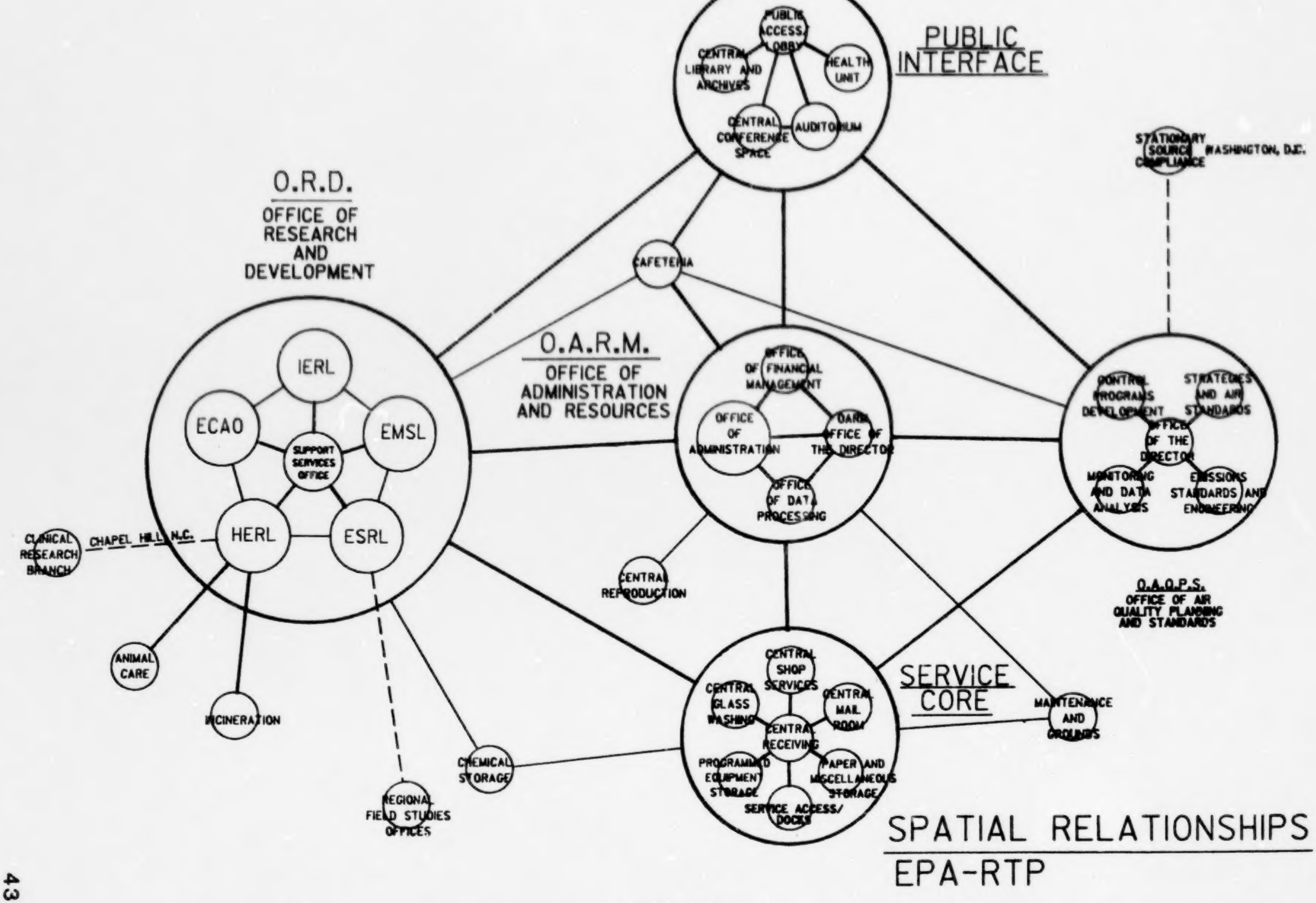

REPRODUCTION
CENTRAL O.A.R.M. COMPUTER
OFFICE OF ADMINISTRATION
INCINERATION
AUDIO-VISUAL BRANCH
PERSONNEL MANAGEMENT DIVISION
CONTRACTS MANAGEMENT DIVISION
OFFICE OF FINANCIAL MANAGEMENT
SUPPORT SERVICES BRANCH
GENERAL SERVICES DIVISION
O.A. OFFICE OF THE DIRECTOR
O.A.R.M. OFFICE OF THE DIRECTOR
HEALTH UNIT
CHEMICAL STORAGE
PROPERTY MANAGEMENT BRANCH
FACILITIES MANAGEMENT BRANCH
CENTRAL CONFERENCE SPACE
AUDITORIUM
PUBLIC ACCESS/LOBBY
OFFICE OF DATA PROCESSING (NATIONAL COMPUTER CENTER)
PUBLIC INTERFACE
STORAGE (WAREHOUSING)
PAPER AND MISCELLANEOUS STORAGE
CENTRAL RECEIVING
SERVICE ACCESS/DOCKS
CENTRAL MAIL ROOM
SHOP SERVICES
TRAINING ROOMS
LIBRARY
CAFETERIA
CAFETERIA SERVICE DOCKS
MAINTENANCE AND GROUNDS
SERVICE CORE

SPATIAL RELATIONSHIPS

OFFICE OF ADMINISTRATION & RESOURCES MANAGEMENT



SPATIAL RELATIONSHIPS

EPA-RTP

PUBLIC INTERFACE
PUBLIC ACCESS/ LOBBY
CENTRAL LIBRARY AND ARCHIVES
HEALTH UNIT
CENTRAL CONFERENCE SPACE
AUDITORIUM
O.R.D.
OFFICE OF RESEARCH AND DEVELOPMENT
IERL
ECAO
EMSL
SUPPORT SERVICES OFFICE
HERL
ESRL
CLINICAL RESEARCH BRANCH
CHAPEL HILL N.C.
ANIMAL CARE
INCINERATION
REGIONAL FIELD STUDIES OFFICES
CHEMICAL STORAGE
CAFETERIA
O.A.R.M.
OFFICE OF ADMINISTRATION AND RESOURCES
OFFICE OF FINANCIAL MANAGEMENT
OFFICE OF ADMINISTRATION
OARM OFFICE OF THE DIRECTOR
OFFICE OF DATA PROCESSING
CENTRAL REPRODUCTION
STATIONARY SOURCE COMPLIANCE
WASHINGTON, D.C.
CONTROL PROGRAMS DEVELOPMENT
STRATEGIES AND AIR STANDARDS
OFFICE OF THE DIRECTOR
MONITORING AND DATA ANALYSIS
EMISSIONS STANDARDS AND ENGINEERING
O.A.Q.P.S.
OFFICE OF AIR QUALITY PLANNING AND STANDARDS
SERVICE CORE
CENTRAL SHOP SERVICES
CENTRAL GLASS WASHING
CENTRAL MAIL ROOM
CENTRAL RECEIVING
PROGRAMMED EQUIPMENT STORAGE
PAPER AND MISCELLANEOUS STORAGE
SERVICE ACCESS/ DOCKS
MAINTENANCE AND GROUNDS

SUMMARY OF EVALUATION OF EXISTING FACILITIES

The following information is a summary of an evaluation of the existing facilities for EPA in the Research Triangle Park area and the potential of those facilities to meet the projected needs in 1990. The findings presented herein are based on interviews conducted by Odell Associates Inc., with EPA personnel, as well as field investigations and reviews of documentation of the existing facilities.

The evaluation of the existing facilities indicated that the facilities have been continually modified over the last 14 years to meet the changing needs of EPA, and that many of these needs have been adequately met based on the programs now in operation. However, the evaluations also exposed several concerns if these facilities are to meet the projected needs for 1990 and beyond. These concerns are outlined in more detail under individual building descriptions, but are briefly summarized below. First, as stated above, the present facilities will not provide a sufficient amount of space to house all 1990 EPA functions in the Research Triangle Park area. Additional space will be required for nearly every function located in the Park. If the existing complex is to be expanded, the expansions will have to be integrated into the existing complex to achieve the proper interrelationships of the various functions.

A second concern in evaluating the facilities was the obvious lack of a clear organizational relationship between various functions and organizational components. The desired relationships identified by the adjacency interconnection and functional interuse matrices and bubble diagrams are not evident in the existing complex. Because of the present dispersement of related research functions throughout the facilities, the spaces allocated by individual laboratories/division/branches are not grouped together to establish the individual identities necessary for these organizational components. The distances between lab space, office space and support space within each organizational component is excessive and therefore causes inefficiencies and several redundancies. To compound this problem, EPA is presently located in nine different buildings within the Research Triangle Park area, which magnifies the problem of proximity between similar functions; even though some of the nine buildings need to be located where they are. For example, the Clinical Research Facility, which will be evaluated in a separate report, needs to be near the Chapel Hill Medical School, and the Camio Facility needs to be within an urban area such as Durham to monitor air pollution. This does cause inefficiencies in time and motor pool costs to commute from building to building, in phone service between buildings, and in redundancies in common use facilities such as cafeterias, lobbies, conference areas, central receiving, warehousing, central energy plants, etc.

Another concern with the existing facilities is in regard to present code deficiencies, life safety concerns, hazardous conditions, and deficiencies in specialized heating and air-conditioning systems, electrical systems, and special construction required due to the unique nature of the EPA activities. These conditions are addressed elsewhere in this report. Because all of the buildings are leased facilities except Camio which is EPA-owned, there are limitations which prevent many of the problems from being corrected. The Economy Act of 1932 reads that "....no appropriation shall be obligated or expended... for alterations, improvements, and repairs of the rented premises in excess of 25 per centum of the amount of the rent for the first year of the rental term." This relatively small amount of money not only prohibits major changes and improvements in the facilities, but also limits the flexibility of the facilities to deal with needed changes due to program redirections through the life of the facilities. Even if these changes could be accomplished, they would require the approval of the numerous building Owners. There would definitely be advantages in having government owned facilities for EPA which could be modified as needed to respond to the constantly changing programs of EPA research and development.

One additional concern with the existing facilities being modified to meet the projected needs for 1990 is the feasibility of accomplishing the needed modifications within fully-occupied facilities. The facilities most needing major changes are the research facilities in the Environmental Research Center (ERC) and the ERC-Annex. Unfortunately, due to the nature of work taking place in these buildings, they are also the most difficult to change. As stated previously, the spatial interrelationships of organizational components (laboratories/divisions/branches) and the proximity requirements of functional elements such as laboratory space, office space, space for equipment storage, space for support facilities and the animal care facility are simply not adequate and conducive to proper research. A major rearrangement of these organizational and functional elements according to the desired relationships as identified in the spatial matrices and bubble diagrams is critically needed, but would result in a major disruption to ongoing programs and would require a considerable amount of downtime. Such an undertaking would involve not merely moving people around within the buildings, but would also involve major upfitting changes to establish the correct spatial interrelationships. Logistically, this would not be feasible unless the buildings could be partially or wholly vacated for an extended period of time during the construction upfitting period. Vacating the buildings would not only require a highly-specialized interim facility and major moving expenses, but would result in many ongoing programs, some of which are run for years under specially controlled environments, being prematurely terminated. This undertaking would be very costly; however, the cost considerations would be of secondary concern compared to the concerns of having major disruptions of research activities over an extended period of time. Realistically, a one time move into a new facility would be more feasible, especially since the tentative moving date could be established years in advance, allowing the durations of the research programs to be planned around this date.

The scope of needed changes could be reduced if all high-hazard functions could be moved out of the present facilities and into a new facility. The present research facilities could be adjusted to accommodate office and low-hazard research functions without any major code or safety violations. However, this would still involve a major disruption due to the reshuffling of people and programs and the construction upfitting activities.

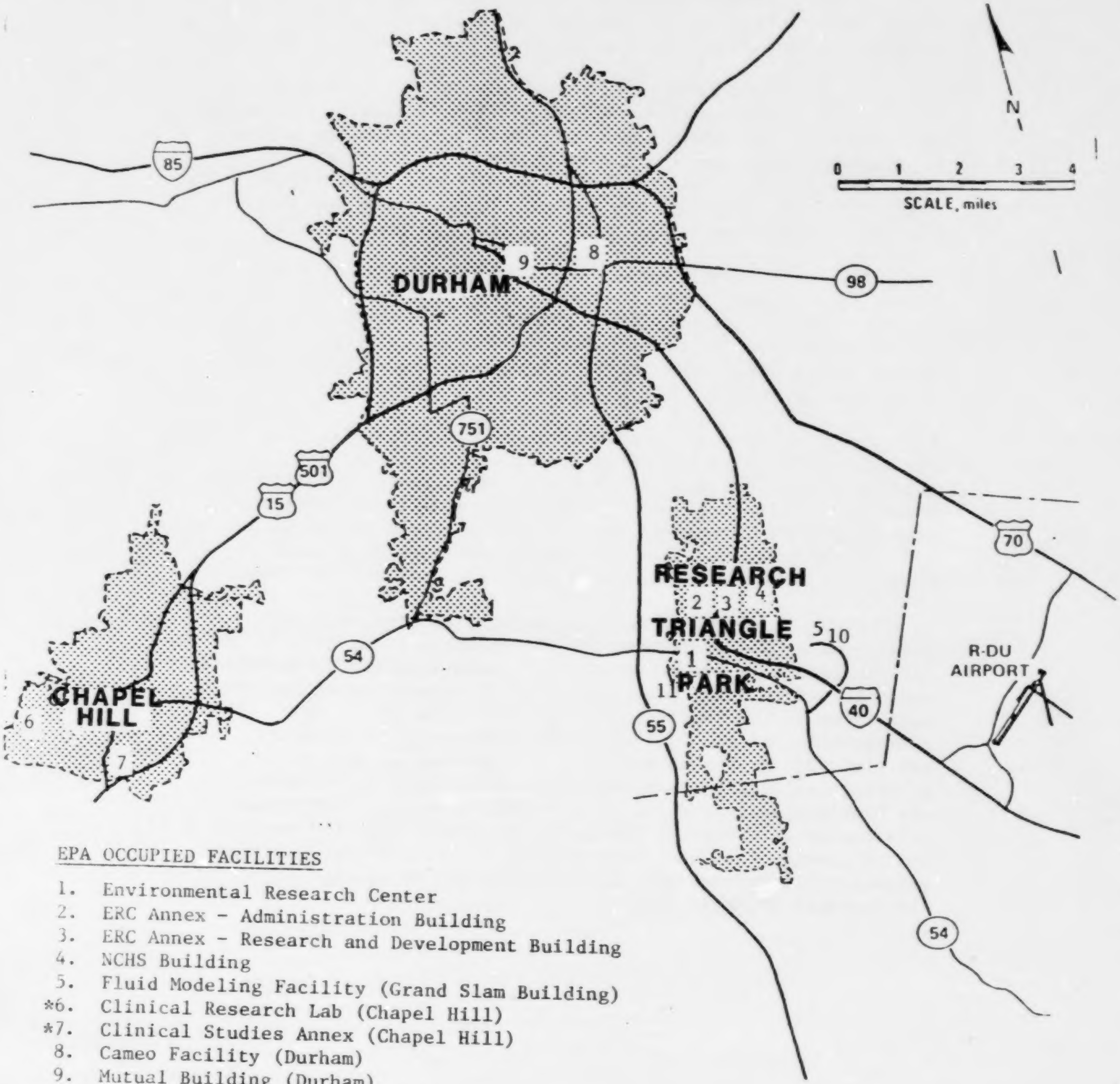
The only other feasible option for a reorganization of spaces within the research facilities would be to continue with the present policy of accommodating needed changes as the needs arise within the context of the existing spatial organizations. This option though would never allow for the wholesale changes that are so critically needed.

Following this summary is a building by building evaluation of the EPA facilities, with a description of each building, and the ability of each building to serve the appropriate needs for 1990 and beyond. Also included is a tabulation of lease costs and operating and maintenance costs of all buildings in todays dollars and in 1990 dollars. This information was used as a basis of comparison when evaluating the various alternatives for 1990.

In conclusion, it should be reemphasized that the existing facilities are so inadequate for the specific needs of EPA, and the various functions and organizational components are so dispersed among the various EPA buildings, that the operation of the EPA activities in the Research Triangle Park area are almost unmanageable and are full of inefficiencies and redundances. In addition, due to the severe code deficiencies of many of the existing buildings, these facilities are simply not adequate for the highly specialized and often highly hazardous conditions inherent in this type of research. To accommodate the needs of EPA and to provide for the future changes in research and continual program redirections, new facilities should be planned for within the Research Triangle Park.

EPA Facilities

Research Triangle Park , North Carolina


N
0 1 2 3 4
SCALE, miles
85
98
9
8
DURHAM
751
501
15
70
RESEARCH
2 3 4
TRIANGLE
5 10
1
11 PARK
R-DU
AIRPORT
40
55
54
54
CHAPEL
HILL
6
7

EPA OCCUPIED FACILITIES

1. Environmental Research Center
2. ERC Annex - Administration Building
3. ERC Annex - Research and Development Building
4. NCHS Building
5. Fluid Modeling Facility (Grand Slam Building)

*6. Clinical Research Lab (Chapel Hill)

*7. Clinical Studies Annex (Chapel Hill)

8. Cameo Facility (Durham)
9. Mutual Building (Durham)
10. EML (Emission Measurement Laboratory)
11. Alston Avenue Road Warehouse

*Chapel Hill Facilities are not included as part of this study and will be evaluated in a future report.

ENVIRONMENTAL RESEARCH CENTER

The Environmental Research Center is the main research facility at Research Triangle Park and is located on a 49 acre site at the corner of N.C. 54 and Alexander Drive.

BUILDING LEASE:

The terms of the existing lease began with the Government on September 21, 1970, to run through September 21, 1990. The lease provides both the structure and approximately 49 acres of land. The lease does not contain a cancellation clause for either contracting party.

BUILDING DESCRIPTION AND DEFICIENCIES:

General (Architectural/Structural)

The Facility was originally constructed under a "build lease" agreement by Piracci Construction Company of Baltimore, Maryland, in the late 1960's. The building design was based on a Program of Requirements (POR) prepared by the National Center for Air Pollution Control (then under the Department of Health Education and Welfare) in 1968. According to the requirements then envisioned, the facility was designed and constructed under the Industrial Classification of the North Carolina Building Code. At that time the Code's requirements represented the proper construction standards for a facility of that type.

Today, ERC functions much differently than it did when first built. Since 1970, numerous modifications and expansions have been made in an attempt to accommodate program changes and new requirements. The most significant expansions have been two additions to the Data Processing Center, construction of a waste water monitoring facility, a hazardous materials and incinerator building, an addition to the animal care facility, and various specialized laboratory spaces. A former greenhouse has been converted, with only moderate success, to an animal care facility. Warehouse spaces within the ERC facility have been converted to pilot plant operations. With the various modifications there have been some successes, as in the K-1 area for Genetic Toxicology along with numerous other efforts in which the flexibility of the building allowed for relatively easy changes. And although many of the common use functions, such as the cafeteria, auditorium, health unit and support facilities are still adequate today, the majority of the facility is being utilized in vastly different ways than it was originally intended. The Environmental Research Center is presently housing a wide variety of laboratory, office, and special purpose space, including animal care facilities, isolation rooms, hazardous chemical handling rooms, pilot plant operations, and numerous other specially constructed areas. Health Effects Research Laboratory, (HERL), for example, has approximately 250 separate laboratory functions and this is only one laboratory of many at ERC. The functional complexity is an aspect of the facility that is not expected to change through 1990.

This facility is on approximately 49 acres of land including an adjacent trailer storage park, other small storage buildings and parking areas surrounding the entire ERC.

There are, however, many deficiencies within the existing facility. Included, are several areas in which the building limits the flexibility of specific programs and functions, and in many cases the maximum amount of flexibility has already been reached. Interior walls, ceilings, and floor surfaces are, in numerous areas, inadequate for present or projected needs. For example, impervious surfaces, which are necessary in specific research programs, are almost nonexistent within this building. The building shell itself limits many functions to less than ideal room sizes and relationships. However, based on the existence of numerous vertical chases along the exterior perimeter for HVAC and piping and the use of the 110 building module, the building is reasonably flexible for its intended use.

Structurally, the ERC facility is fairly adequate for present use with a few exceptions. A problem encountered by several of the occupants of the laboratory wings is floor vibration causing problems with electron microscopes and high technology weight measuring equipment. This is a problem that cannot feasibly be solved on supported floors of this building due to the nature of their construction. The ground floor (concrete slab-on-grade) is the only area of this facility in which vibration would not be considered a problem.

The roof of all buildings in this complex have presented a problem for several of the occupants. Specifically, the roof is not designed for any loads in addition to the North Carolina Building Code required 20 pounds per square foot live load and existing dead load. Anytime a chiller or exhaust hood has been added due to specialized functions, special framing had to be added. This is an inconvenience that appears to have been solved as there is a great deal of equipment of the laboratory roofs at present.

Other problems encountered in this complex were settlement cracks, moisture migration through floor slabs on grade, and one unidentified water leak under "H" Wing. These are isolated minor problems that do not effect the general overall use or function of the building. Floor live load capacity of 100 psf appears to be adequate for the present and future use of the building.

Code Violations

The ERC facility is today classified a "high hazard" occupancy per the "Facilities Safety Handbook for the United States Environmental Protection Agency." This classification reads "those buildings' whose contents are liable to burn with extreme rapidity or from which poisonous fumes or explosions are to be feared in the event of a fire." Along with the Code requirements for "high hazard" occupancies outlined in the National Fire Protection Association (NFPA), there are numerous safety code violations that, together with ASTM and OSHA code violations, have created a situation in which the facility must be considered hazardous. Many of these deficiencies are due to the fact that ERC was constructed under the "Industrial Classification" of the North Carolina Building Code. For example, as per the "Facilities Safety Handbook for the United States EPA" (figure 3-1c), the maximum building height for "high hazard" occupants in an unprotected non-combustible steel structure with only hazardous areas protected by automatic suppression system, is one story. ERC is for the most part a three story structure with no sprinkler system anywhere in the facility. Also, according to the requirements outlined in NFPA 45 a "high hazard" laboratory under 1,000 square feet in this type of building must have a 2-hour fire separation from non-laboratory areas and a 1-hour fire separation from lab units of equal or lower hazard classification. The separation by interior walls at ERC is mostly with unrated RACO type demountable walls which stop at the ceiling tiles. This in itself makes contamination a real danger in the event of an accident.

Along with other code violations and concerns, the ERC simply does not meet the EPA's numerous safety requirements for an operation of this type. With research expected to be getting even more sophisticated by 1990, requiring facilities with more specialized construction with sensitive laboratory environments, the feasibility of obtaining a safe working environment could only be met if the "high hazard" operations were moved from the facility.

Lack of Space

There is no question but that lack of space is a real and urgent problem at ERC. Space that was once designated as storage, has long since been converted to extra lab or office space presently making storage almost nonexistent at ERC. Labs are filled with equipment that need to be stored near by. Spaces that were once allocated for warehouse usage are now very hazardous, overcrowded, ERL pilot plant facilities. Present equipment in these areas are so crowded that several adjacent projects cannot be operated simultaneously in a safe, effective manner. Some labs at ERC cannot use equipment needed for their research because of lack of space and/or safety concerns. A former greenhouse has been converted into an animal care facility - a facility which has very specific construction and environmental requirements. Animal care presently does not have the space necessary for the proper handling, care, housing, or treatment of animals as outlined in the "Laboratory Animal Act" which also applies to any agency of the United States Government. Space for animal quarantine, isolation and clinical and histopatholigic diagnostic laboratory facilities is simply not available. Much of the research and special purpose space necessary for present and projected needs at ERC is inadequate in terms of quantity and quality. There is such a need for additional space that some organizations simply cannot function properly.

The Jester Road storage trailer park, adjacent to the ERC facility currently houses much of the equipment, chemicals, mobile laboratories and miscellaneous items that cannot be stored at the present ERC Building.

Allocation of Space

The mere lack of space is certainly not the only spatial concern at the ERC. Over a number of years, with reorganization, program changes and a variety of other factors, the allocation of space has become disorganized and inefficient throughout RTP. Many of the laboratory divisions are dispersed throughout the facility and other EPA buildings. This dispersement of research has caused some redundances and duplications of instruments, environmental chambers and support facilities, as well as poor coordination between labs, divisions and offices. It has also made supervision difficult and even created a situation in which some experiments are impossible to perform.

The location of many of the HERL facilities at ERC in relation to the animal care facilities has also caused problems. HERL uses approximately 80,000 animals a year in research. Many of these animals must be transported from Animal Care located at one end of ERC to HERL labs, some of which are at the opposite end of the facility. This means that animal carts must be rolled through corridors with administrative offices, non-animal using laboratories and laboratories whose sensitive equipment cannot properly function with the vibration caused by the animal carts. In many cases, people with offices are far apart form their laboratories creating inefficiency for persons needing to be in close proximity to both.

There are in addition, concerns with the Central Receiving areas and the Chemical Storage areas and their relationship with various functions.

Although less severe, Data Processing has similar concerns with the computer raised floor areas being divided among three floors causing some redundant space requirements. Data Processing is also split among three other off-site buildings.

Perhaps the most striking example of spatial dispersement problems is with the Inhalation Toxicology Division of HERL (Toxicology Branch) which presently occupies space in approximately nine separate wings or floors throughout ERC. It is easy to understand how the various functions became so dispersed over a number of years of changing programs. The lack of centralization and organization is, however, a problem that has no easy solutions and leaves EPA with a limited ability to achieve the correct spatial relationships.

Occupancy Totals

This facility is currently 100% occupied. EPA is the sole tenant. The following includes all additions and expansions at ERC and represents the space occupied by specific EPA organizations:

Organization	Net Total
OARM-Office of Data Processing	55,225 sq. ft.
OARM-Office of Administration	23,530 sq. ft.
ORD-EMSL	14,500 sq. ft.
ORD-ESRL	22,515 sq. ft.
ORD-HERL	90,150 sq. ft.
ORD-IERL	42,776 sq. ft.
ORD-SSO	4,890 sq. ft.
OAQPS	3,150 sq. ft.
Total Net (ERC)	256,736 sq. ft.
(Net Office Space)	80,280 sq. ft.
(Net Common Lab Space)	32,770 sq. ft.
(Net Special Purpose Space)	143,686 sq. ft.
Total Gross (ERC)	394,978 sq. ft.

Electrical

Power

Existing: The main facility receives its electrical power from Duke Power Company via a high voltage substation located on-site. The Duke Power owned substation consists of two 10,000 KVA transformers, with one of these two transformers being a standby unit. One 4160 Volt and three 24 KV feeders emanate from the Duke Power substation. Feeder No. 1 (4160 V) is owned by EPA and feeds the high voltage switchgear in "E" Wing, Level 1. Feeder No. 2 is owned by Duke Power and feeds a 2,000 KVA Duke Power owned transformer. Feeder No. 3 is owned by Duke Power Company and feeds a 1,000 KVA Duke Power owned transformer. Feeder No. 4 is owned by Duke Power Company and feeds a 500 KVA Duke Power owned transformer. Feeder No. 5 is owned by Duke Power Company and feeds a 500 KVA Duke Power owned transformer.

The high voltage switchgear in "E" Wing fed by Feeder No. 1 is owned by EPA and feeds the majority of the complex. All feeders, panels, etc., fed from this switchgear are also owned by EPA. This high voltage switchgear feeds Substation "E" (which feeds loads in "E" Wing), Substation "P" (which feeds loads in "P" and "Q" Wings), Substation "M" (which feeds "M" and "N" Wings), Substation "K" (which feeds "K" and "L" Wings), Substation "B" (which feeds "A", "B" and "C" Wings), Substation "J" (which feeds "J" Wing and greenhouse) and Substation "H" (which feeds "G" and "H" Wings).

The 2,000 KVA transformer fed by Feeder No. 2, feeds new disconnect switches "A" and "B", which feed the two new Computer UPS Systems. All electrical equipment on the load side of the transformer is owned by EPA.

The 1,000 KVA transformer fed by Feeder No. 3 feeds new disconnect "C", which feeds the two new rooftop air conditioning units for the new computer area. All electrical equipment on the load side of the transformer is owned by EPA.

The 500 KVA transformer fed by Feeder No. 4 feeds new disconnect switch "D", which feeds normal computer loads. All electrical equipment on the load side of the transformer is owned by EPA.

The 500 KVA transformer fed by Feeder No. 5 feeds power to the high bay area and "I" Wing.

The maximum electrical demand for the past year for the facility was 5350 KW (not including the new A/C units for the computer area). Enough power is on-site in the Duke Power main Substation for all existing loads and all anticipated future expansion.

Deficiencies:

Most of the wings have sufficient power available in their individual substations for future expansion. The one exception to this is the IERL group in the high bay area. In order to remedy this problem and provide for future expansion in this area, the existing separate service from Duke Power for this area should be enlarged by the Power Company with new secondary switchgear to be installed by EPA.

According to the EPA facilities safety handbook, either Ground Fault Circuit Interrupting receptacles for existing facilities or Ground Fault Interrupting breakers for new facilities are required in all laboratories. These do not presently exist in all laboratories. This could be a very expensive renovation item for the existing laboratory facilities. For a new facility, this could be done at much less expense.

Emergency Power

Existing:
One 400 KW emergency generator provides life safety emergency power for all wings of the facility. A smaller emergency generator exists for "I" Wing facilities. In addition, a 200 KW emergency generator exists for emergency requirements of first floor of "K" Wing.

Two UPS systems exist for the computer facilities.

Deficiencies:
The following groups need emergency power (Not UPS) for their operations: OARM, GSD, HERL-ITD Toxicology, Genetic Toxicology and Computer A/C. A new emergency generator and emergency power distribution system should be installed for these operations. This would be an expensive renovation project.

The following groups need UPS power for their computers and laboratory equipment: IERL, ESRL, HERL-ITD Toxicology Biochemistry Department, Neurotoxicology Neurochemistry Department; and PAB-EMD. It is impractical to distribute power from the existing UPS system or to provide a central UPS system for these departments in the present building. Therefore, if space allows, an individual UPS system must be installed for each Department, at considerable expense. If these departments were located adjacent to each other in a new building, a central UPS system could be provided for all departments at considerably less expense than for the individual units.

The IERL, HERL and ESRL groups both need "clean" power for their laboratory instruments. Small power distribution units could be located in these areas if all laboratory equipment was located in close proximity of each other and if space were provided for them. These units, however, are very expensive.

Hazardous Areas:
Explosion proof lighting fixtures need to be installed in all areas where explosive gases are present.

Hood fans for use where hazardous chemicals are present should be on emergency power.

Life Safety:
Sufficient emergency power exists for most of the life safety requirements.

Building should be sprinklered with smoke detectors in all electrical rooms.

Smoke detectors in Blue Room do not interact properly with Halon system. Need backup for Halon in both computer areas.

Other Systems:
Special power needed for electron microscopes.

Computer Room security system not sufficient.

Halon alarms for Computer Room should be centralized.

Mechanical

General Overview

Overview of Existing Heating, Ventilating and Air Conditioning Systems:

The main research facility is heated and cooled by central air handling units located throughout the building complex. These central air handling units are supplemented by approximately 100 self-contained air conditioning units located throughout the facility. These are approximately 2-4 tons each. The air handling units have chilled water and steam coils. Chilled water is supplied via a piping distribution system from a central energy plant located in the building complex. This central plant houses three 500 ton centrifugal chillers and one 200 ton centrifugal chiller. In addition to the central plant several buildings have a separate chilled water supply. "I" Wing has two 38 ton chillers and the Greenhouse has two 85 ton chillers. The National Computer Center has two 200 ton chillers. A 250 ton absorption chiller is installed in "G" Wing.

Steam is provided to the air handling units by a piping distribution system from the central energy plant. Two 22,940,000 BTU per hour boilers are installed in this energy plant. The "I" Wing animal research facility has one boiler rated at 2,907,000 BTU per hour serving an air handling unit, humidifiers, and a washer. "G" Wing has one boiler rated at 8,857,000 BTU per hour. Humidification is provided in air handling units throughout the complex using steam.

Utility chases are located at intervals of approximately 22 feet along the perimeter of "K", "L", "M", "N", "P" and "Q" Wings. Exhaust ductwork and other utilities are run in these shafts. These shafts allow changes and connections to be made to ductwork and utilities with a minimum disruption to the laboratory spaces.

The air distribution system in the majority of laboratory areas is laid out so that walls can be moved without having to move air diffusers. The air supplied to laboratory areas is totally exhausted not only via the hood exhaust systems, but also via the room exhause system (i.e., a single-pass air system in the ERC).

Overview of Plumbing Systems:

Hot and cold water is provided as required throughout the existing facility. Sanitary sewer connections are provided as required throughout the building complex. Backflow preventers are provided at water connections in laboratory utility chases.

Documentation of Problems:

Heating, Ventilating, and Air Conditioning Systems:

Central Chiller System: A study completed on December 14, 1981, identified a significant deficiency of central chiller capacity at the facility. A total connected load of approximately 2,900 tons was identified with a central chiller plant capacity of 1,700 tons. Since that report an additional chiller capacity of 400 tons has been added at the National Computer Center Building. This reduced the connected load to approximately 2,500 tons. Given the past history of raised discharge temperatures from air handling units, the actual connected load may be close to the chiller capacity. However, these elevated discharge temperatures in the summer seem to have created warm spots in the building facility. Thus, 800 tons may be required to assure sufficient cooling at peak times and standby capacity.

Other HVAC Problems: Based on a review of the facilities and base on discussions with facility personnel the following problems were recorded:

The "I" Wing animal care facility does not have sufficient chiller "back-up" capacity for peak summer cooling months and there is no "back-up" for the one boiler in this facility. The Greenhouse animal care facility chillers appear to be marginal as far as back-up capacity and general condition.

Make up air to hoods is not conditioned causing a temperature rise in hoods during summer.

Numerous areas throughout the building were reported to be difficult to maintain at a constant temperature. Many of these areas were too warm in the summer.

HERL/Toxicology Branch - It was reported that this division has a requirement for temperature and humidity control for exposure chambers and aerosol generation equipment.

IERL/Engineering Applications Division - It was reported that there was a problem with building pressurization and test furnace instability.

IERL/Engineering applications Division - It was reported that this division has a need for dry (30 grain H_2O/lb air) temperature controlled air.

IERL/PTB - It was reported that ventilation in H-302 is not adequate. Room is uncomfortable in summer.

IERL/PTB - It was reported that clean areas need to be provided for equipment and computers. Dust and heat from pilot scale plant creates problems.

IERL/Combustion Research - It was reported that air distribution and circulation have been major problems. There have also been air inlet problems.

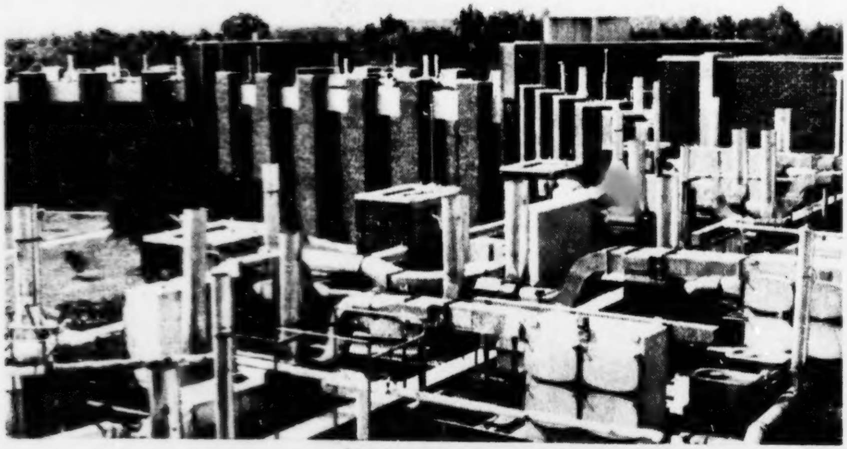
Plumbing Problems:
HERL/Biochemistry - hot water is constantly being contaminated with rusty/gritty water.

There is no waste water treatment facility for toxic materials or biological hazardous materials.

IERL/Combustion Research - It was reported that hazardous waste research operations may require special piping and effluent treatment.

III-14

The Economy Act limits needed renovations and expansions

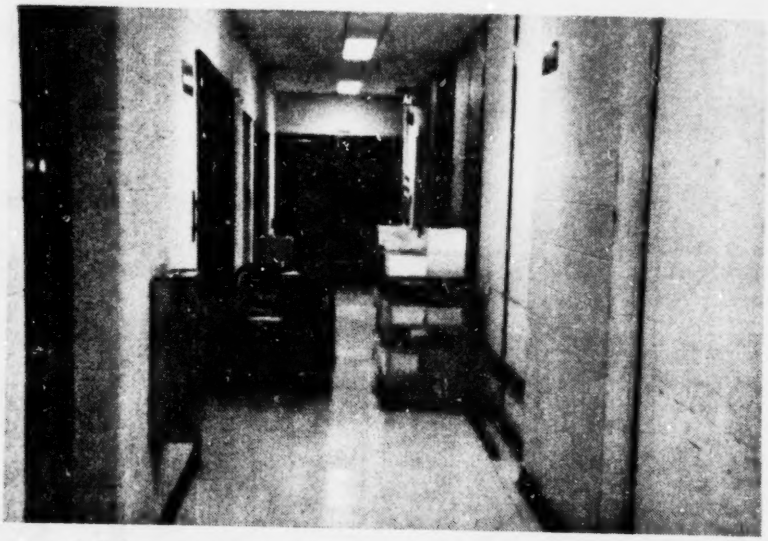


Inadequate space to meet future expansion

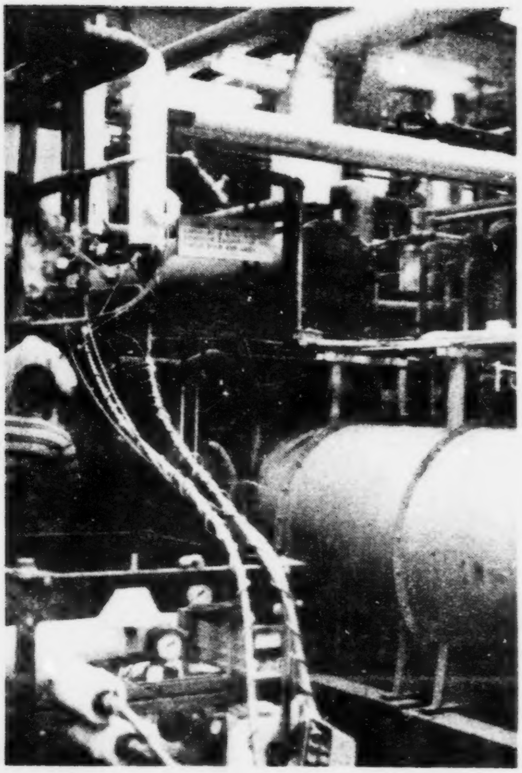
greenhouse converted to animal care facility

inadequate animal rooms for present research

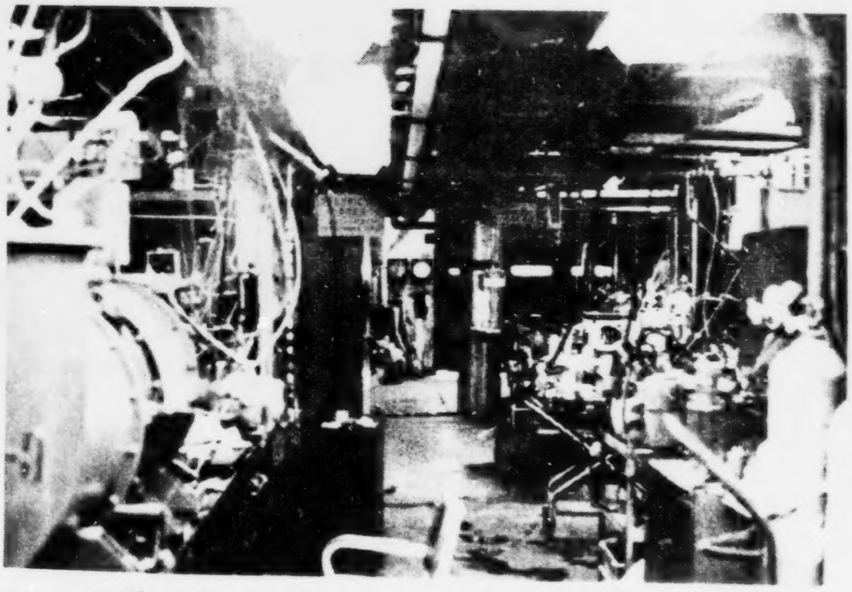
animal carts circulated thru administrative areas frequently



building vibrations, especially those caused by movement of carts through halls , interfere with sensitive instruments such as balances

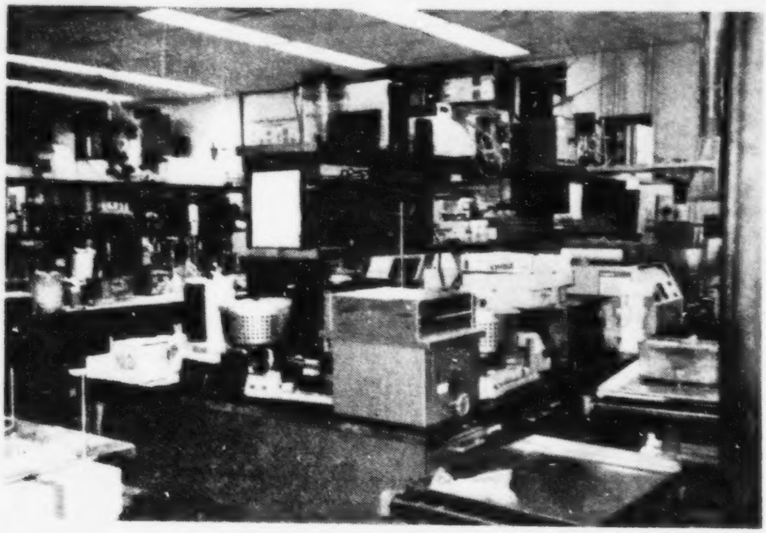


Facilities unavailable for present IERL needs

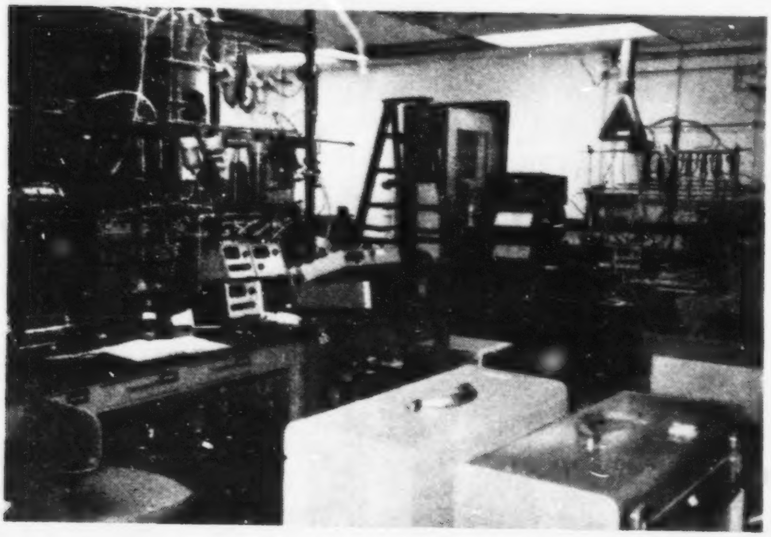


unsafe working conditions due to extreme overcrowding of IERL facilities

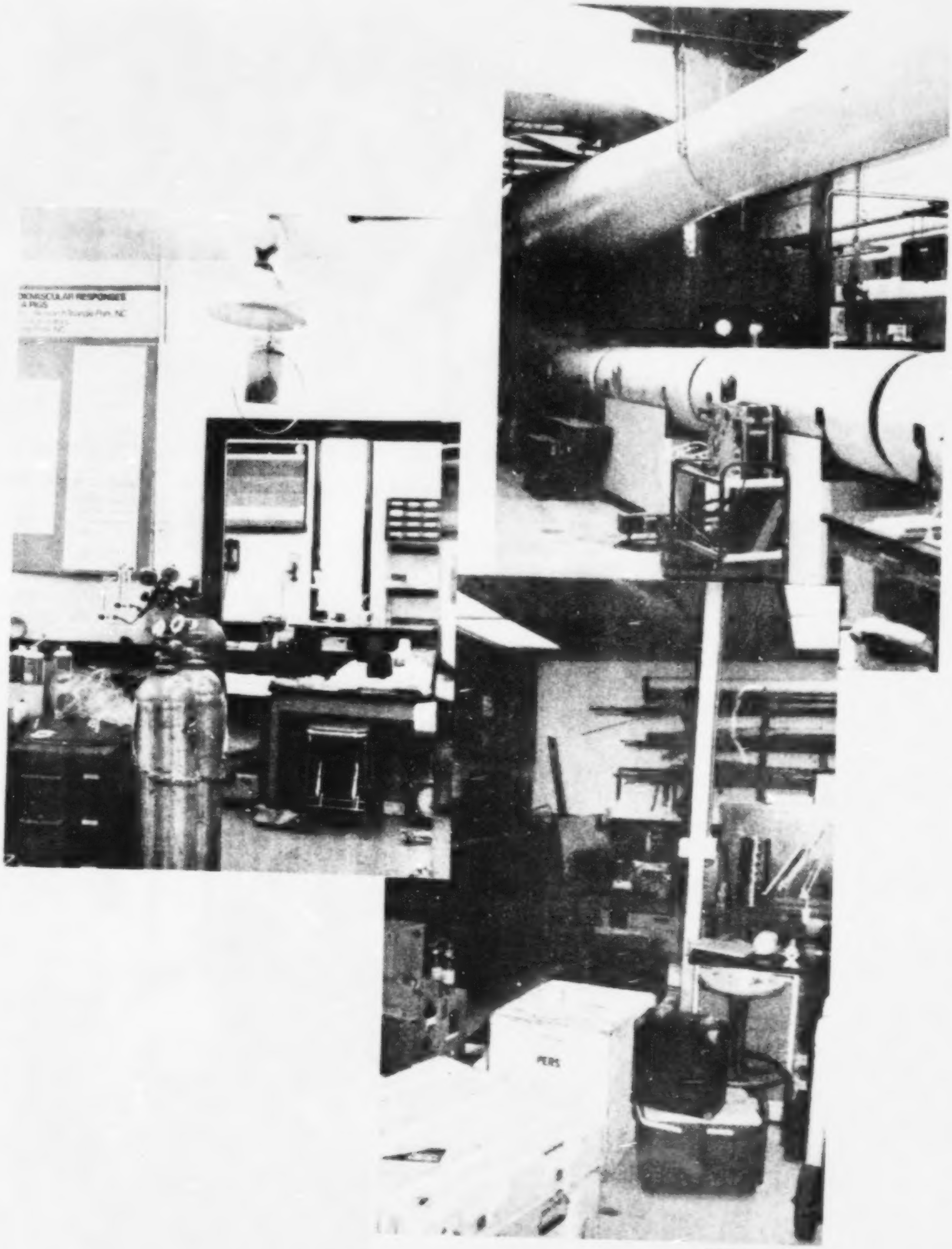
III-18



Labs are filled with equipment which should be kept in storage rooms near the labs. There is presently very little storage space

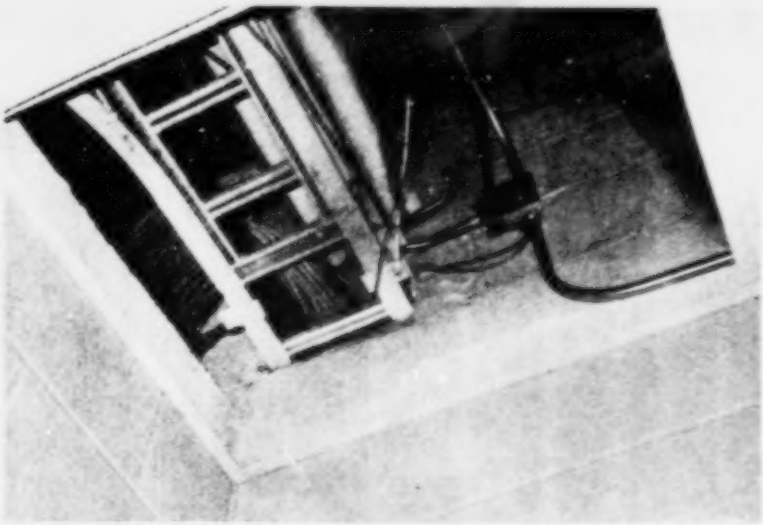


inadequate lab space needed in present research


OMUSCULAR RESPONSES
A PIGS
PERS

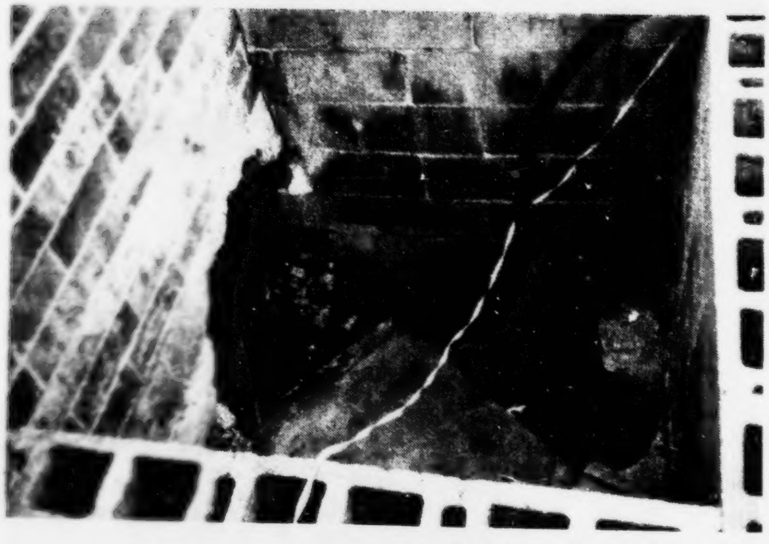
IERL space

III-20

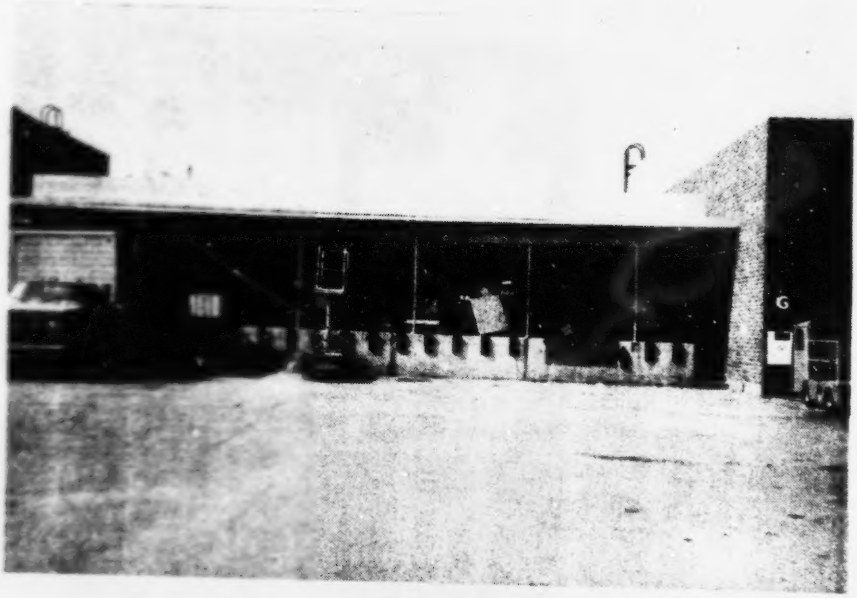


code violations- improper penetration through some fire walls

cramped lab space



floor slab undermined by water

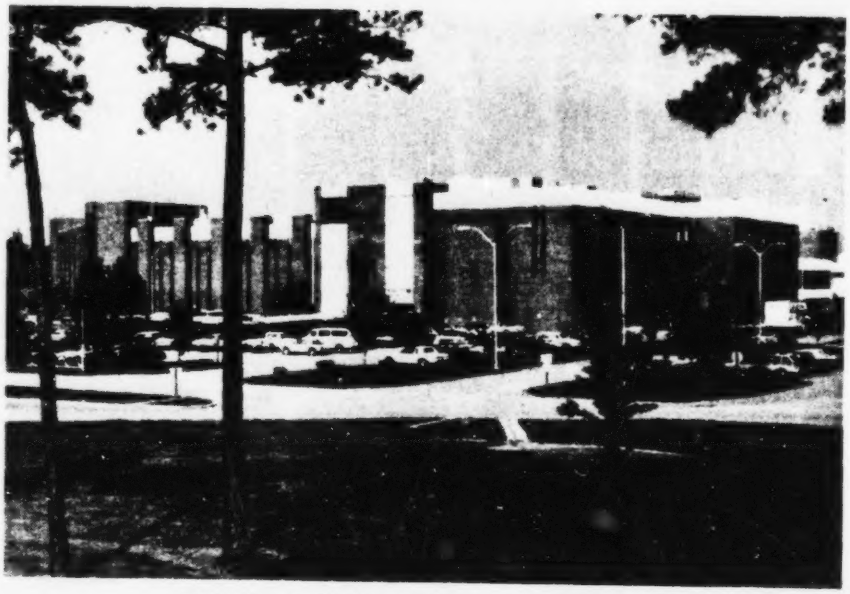


inadequate amount of service entrances

III-22

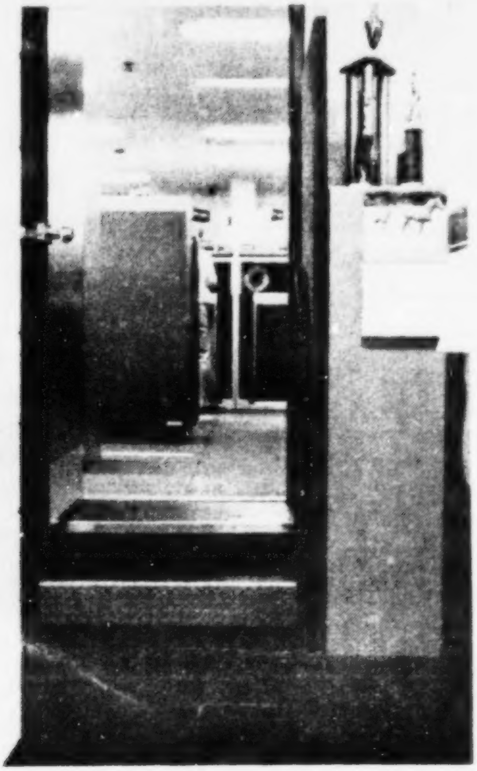
NO SMOKING
OR OPEN FLAMES
WITHIN 50 FEET

Inadequate hazardous materials storage

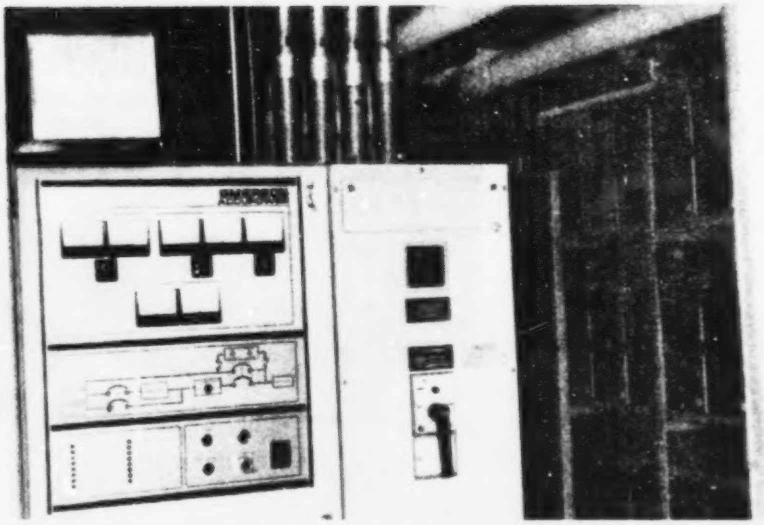


Data Processing has inadequate shipping/receiving /staging area

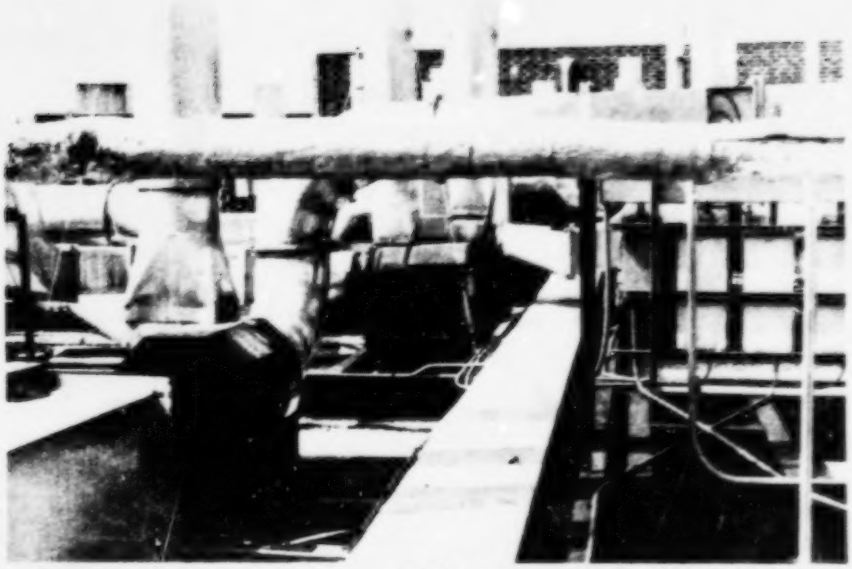
III-23



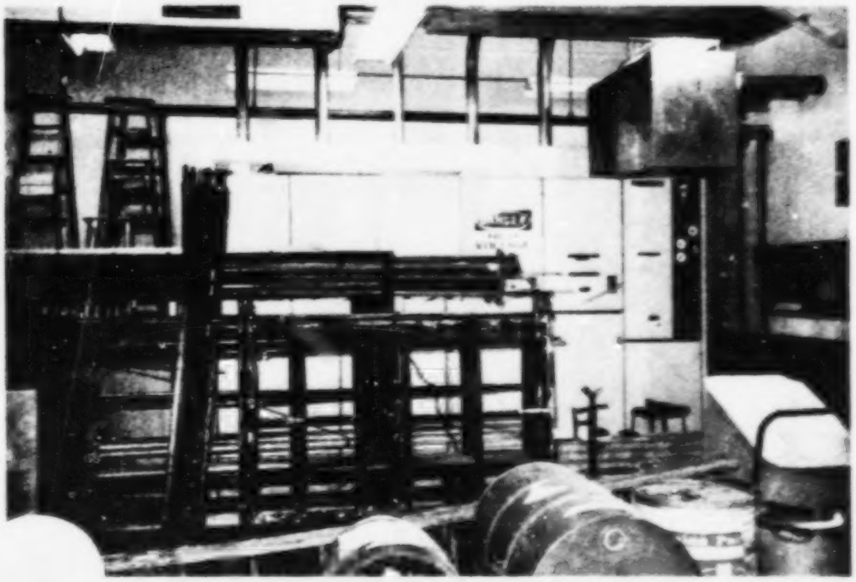
Data Processing level changes



not enough UPS for future expansion



roof load not originally designed for this



improper storage areas

ERC ANNEX-RESEARCH AND DEVELOPMENT BUILDING

Environmental Research Center Annex-Research and Development Building is located off Alexander Drive in Research Triangle Park, North Carolina. The Facility is adjacent to ERC Annex-Administration Building on the same property, and approximately 1/2 mile from the Environmental Research Center.

BUILDING LEASED OR OWNED:

The ERC Annex-Research and Development Building is presently being leased from JHPB Partners. This lease expires August 31, 1990. There is, however, an option to extend the present lease agreement three more years to August 31, 1993.

BUILDING DESCRIPTION AND DEFICIENCIES:

General

The facility was originally constructed for Beaunit Corporation, in 1966 as a semi-production plant for textile production research. The Environmental Protection Agency moved into the building in 1975. It has since been converted to accommodate a variety of functions. There are presently sophisticated laboratories, a high bay operation, offices, a centralized supply-receiving area for EPA, a cafeteria and various other special purpose spaces.

Much of what has been converted or modified works quite well; however, there are concerns with some areas which do not function properly to meet the needs of the users. Having originally been a textile building there are certain characteristics that could not be changed. There are only a few windows at the facility. For many functions this lack of natural light is certainly acceptable but for ECAO and various others who are mainly administrative the work environment is poor, at best. Also, the module of the building does not allow for a great deal of flexibility in research space for present or future needs. Structurally, however, the Research and Development Facility appears to be more than adequate for its present use. Exterior block walls some time in the past have been tied back to the floor framing on all sides of the building to halt separation cracks that were forming. Moisture migration and humidity have been periodic problems encountered by ECAO personnel. No other structural problems were evident in this facility.

Occupancy Totals

The facility is presently 100% occupied. EPA is the sole tenant. A breakdown of the net square footage occupied by the EPA organizations is as follows:

ORD-ECAO	6,668 sq. ft.
ORD-EMSL	42,615 sq. ft.
ORD-ESRL	22,096 sq. ft.
ORD-HERL	1,000 sq. ft.
ORD-SSO	1,195 sq. ft.
OARM	16,269 sq. ft.
Other Net(office corridors, Etc.)	29,860 sq. ft.
Net Total	119,703 sq. ft.
(Net Lab)	16,655 sq. ft.
(Net Office)	26,981 sq. ft.
(Net Special Purpose)	42,174 sq. ft.
Gross Total	153,660 sq. ft.

Lack of Space

As in ERC, the Annex Research and Development Building is deficient in the amount of space necessary for present and future needs. There presently exists overcrowding in many areas such as ECAO and EMSL where space is at a premium.

Allocation of Space

This facility is much like ERC in that over time functions have increasingly become dispersed throughout the building and RTP in general. Currently ECAO, EMSL, ESRL, HERL, SSO, and OARM occupy space in the facility. Due to this dispersion of functions, the interrelationships between labs and divisions and between various functions are not adequate and cause an inefficiency in their operations. Also, having these labs divided between ERC and the Annex further magnifies these inefficiencies. There are also circulation problems with the building, partly due to the dispersement of functions throughout the facility and partly due to the limitations of the layouts that were part of the existing building. These relationships do not meet the requirements identified in the matrices and bubble diagrams from the preliminary stage report.

Code Deficiencies

Even though the building is fully sprinklered, with high hazard laboratories the building size exceeds the limits permissible by the North Carolina State Building Code and by the "Facilities Safety Handbook for the United States Environmental Protection Agency." Only a portion of the steel frame is fireproofed, therefore the building is classified as a noncombustible, unprotected structure.

Electrical

Power:
Power is fed to the complex from a Duke Power owned substation with 2-1000 KVA transformers. Delivery voltage is 4160 volts.

Power is distributed throughout the complex from EPA owned high voltage switchgear to six transformers and two large A/C units. There are five EPA owned substations with 750 KVA transformers and one EPA owned substation with 500 KVA transformers. All panelboards and feeders within the building are owned by EPA.

The maximum demand for the complex (including the Administration Building) was 1543 KW. An increase in activity at the complex that would cause the demand to increase by 33% would also require new service from Duke Power.

Emergency Power:
No centralized emergency power exists for life safety equipment. All egress lighting is via hard to maintain battery units. A centralized emergency generator system would be much easier to maintain.

The ECAO division needs a UPS system for their computers. Space constraints and non-centralization of facilities make this a very difficult task to complete.

Hazardous Areas:
No problems were evident with hazardous conditions.

Life Safety:
The facility is completely sprinklered and smoke detectors exist in elevator lobbies and electrical areas.

Other Systems:
No dedicated circuits exist for special equipment.

Mechanical

General Overview:

Overview of Existing Heating, Ventilating and Air Conditioning Systems:
The building complex is heated and cooled by central air handling units located throughout the building complex. The air handling units have chilled water and steam coils. Chilled water is supplied via a piping distribution system from a central energy plant located in the building complex. This central energy plant houses two 670 ton centrifugal chillers. Steam is provided to the air handling units and building by a piping distribution system from this same central energy plant. Two 10,042,500 BTU per hour fire tube boilers produce the steam. Laboratory hoods are located throughout the facility and duct from these hoods are run to the roof exhaust fans.

Overview of Plumbing Systems:
Hot and cold water is provided as required throughout the existing facility. Sanitary sewer connections are provided as required. Air, vacuum, softwater, and Nitrogen piping systems are installed in building.

Documentation of Problems:

Heating, Ventilating, and Air Conditioning Systems:
ECAO - It was reported that the area of the building occupied by ECAO has experienced high humidity problems.

The design of the building HVAC systems does not allow easy modification of the ductwork systems if laboratories must be relocated, or walls added. The addition of fume hoods is difficult because there is no utility chase to the roof.

EMSL/Quality Assurance Division - It was reported that there were problems reported with temperature and humidity control.

EMSL/EMD/EMTB - It was reported that there were problems with temperature and humidity control.

EMSL/EMD/AATB - It was reported that there were problems with control of temperature. Problems reported with the location of the hood discharge being too close to building air conditioning intakes. This resulted in occasional odor problems.

ESRL/Inorganic Pollutant Analysis Branch - It was reported that critical laboratories do not have constant temperature conditions. Wet chemistry labs need air cleaning and narrow range temperature and humidity control.

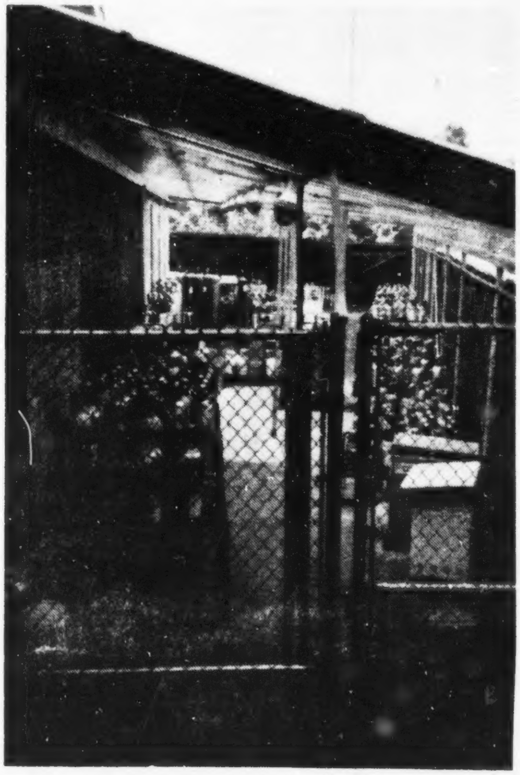
Emergency Operations Facility - It was reported that EOF requires a dedicated HVAC system with charcoal filters for fresh air intakes and a means of closing off the outside air to facilitate use of recirculated air.

III-29

building water leak damage

poor flexibility of labs due to building module

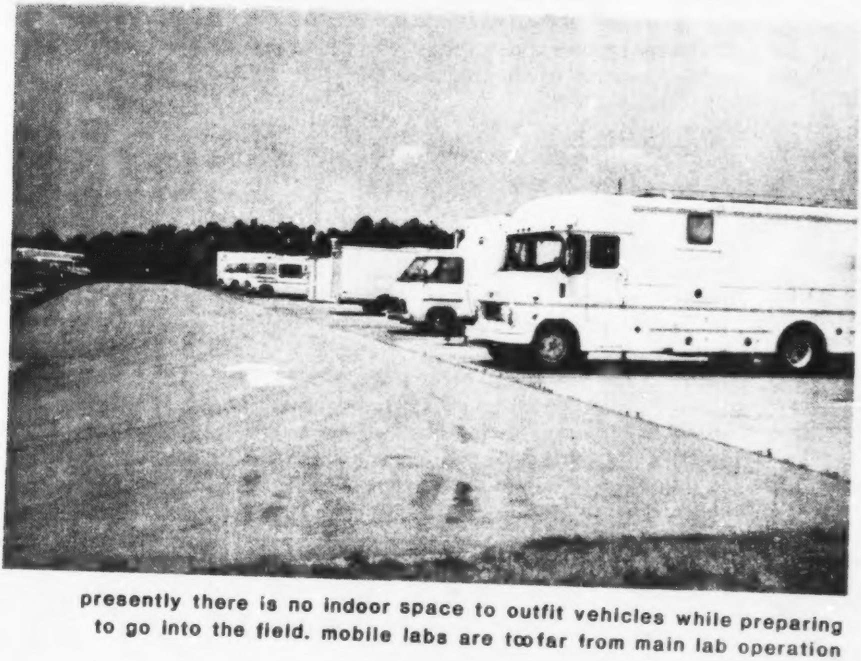
III-30



gas cylinder repository

pocr access from outside vehicular entrance

research is split between many
locations creating redundancies and inefficiencies



presently there is no indoor space to outfit vehicles while preparing
to go into the field. mobile labs are too far from main lab operation

ERC ANNEX - ADMINISTRATION BUILDING

The Environmental Research Center Annex - Administration Building is located off Alexander Drive on the same property as the Annex Research and Development Building and is approximately one-half mile from the Environmental Research Center.

BUILDING LEASED OR OWNED:

This facility was leased by EPA from the Beaunit Corporation in January of 1976. This lease was for a five-year period with certain options. This lease expired on August 31, 1983. A new lease was then signed with the new owners (JHPB Partners of Raleigh, North Carolina). This lease expires on August 31, 1990 with a three-year extension clause after that period.

BUILDING DESCRIPTION AND DEFICIENCIES:

General

The ERC Annex - Administration Building was originally constructed for the Beaunit Corporation in 1966 as administrative office space. Today the facility houses the Office of Administration and Resources Management of the Environmental Protection Agency at Research Triangle Park.

Although there have been some modifications to the interior of the buidling, it functions quite well for the present EPA needs of OARM. There are, however, fixed partitions in this building which limit the flexibility of changing program requirements. Although the present space does exceed the GSA requirements for a maximum of 135 square feet per person in office areas, there are no serious deficiencies with the facility at present.

Code Violations

The ERC Annex - Administration Building has no code violations noted for the OARM operations.

Allocation of Space

Space allocated within this facility includes mostly standard office space, a raised floor computer room facility, a print shop, an auditorium and various other miscellaneous spaces. OARM also occupies space in ERC and the ERC Annex - Research and development Building. As with other EPA Divisions, this split-up of functions has created some redundant spaces and inefficiencies. Many of these spaces are, however, necessary support functions for each building. However, functions like mail delivery, and the chemical incineration and storage building, located at only one facility, create inefficiencies in commuting between buildings. The interrelationships between specific spaces within this building although are adequate at present.

Occupancy Totals

The ERC Annex - Administration Building is presently 100% occupied by EPA. The following represents specific space occupied by OARM offices within this facility.

Organization	Net Totals
OARM - Office of Director	704 square feet
OARM - Office of Administration	36,752 square feet
OARM - Office of Financial Management	4,660 square feet

Lack of Space

Currently space at ERC Annex - Administration Building is more than adequate in most areas. Office space, for example, exceeds the GSA requirement of 135 maximum square feet per person. There is, however, a shortage of storage space in this building. Ideally, all of OARM should be housed in a common facility. With the present allocation of space, this facility adequately meets its current requirements for existing and projected needs, assuming though, that changes will have to be made in the allocation of space in 1990 to decrease the office space to comply with the GSA requirements and to increase the amount of support space.

Electrical

Power:
Power is fed to the complex from a Duke Power owned substation with two 1000 KVA transformers. Delivery voltage is 4160 volts.

Power is distributed throughout the complex from EPA owned high voltage switchgear to one transformer and two large air-conditioning units. There is one EPA owned substation with nine 750 KVA transformers and one EPA owned substation with 500 KVA transformers. All panelboards and feeders within the building are owned by EPA. The Administration Office Building is fed by substation T-4, with a 750 KVA transformer.

The maximum demand for the complex for the past year was 1543 KW. An increase of activity at the Annex that would cause the demand to increase by 33 percent would require a new service from Duke Power.

Emergency Power:
No centralized emergency power exists for life safety equipment. All egress lighting is via hard to maintain battery units. A centralized emergency generator system would be much easier to maintain.
OARM presently needs a UPS system for their computers. Space constraints and non-centralization of facilities make this a very difficult task to complete.

Hazardous Areas:
No problems were evident with hazardous conditions.

Life Safety:
The facility is completely sprinklered and smoke detectors exist in elevator lobbies and electrical areas. No deficiencies were noted.

Other Systems:
No problems noted.

Mechanical

General Overview:

The central core of the administrative building is heated and cooled by central multizone air handling units located throughout the building. There are also approximately 50 fan coil units in the building used to heat and cool perimeter rooms.

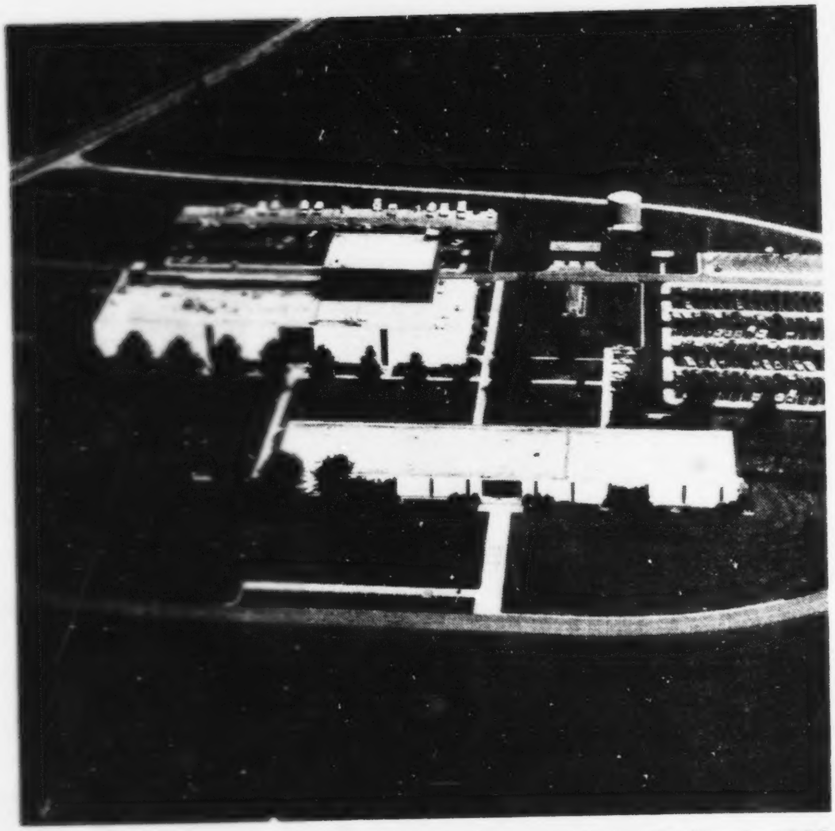
Chilled water and steam are supplied via a utility tunnel; from the Annex Building.

Documentation of Problems:
It was reported that there are areas within the building without adequate cooling.

It was reported that the computer areas need additional cooling.

It was reported that there is a two pipe system in which there is no capability of blending hot and cold water.

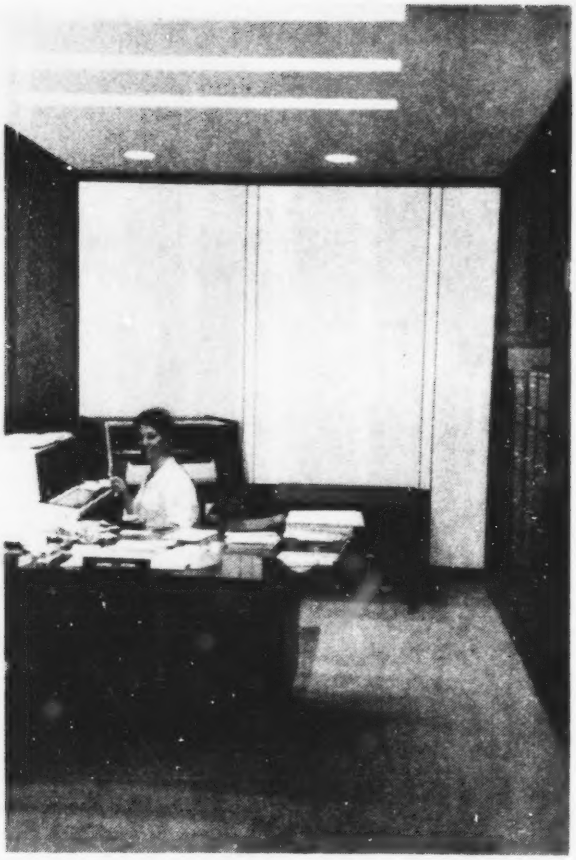
III-35



originally constructed for Beaunit Corp. as textile facility in 1966

the current necessary but redudant support functions would not be needed if all EPA facilities were consolidated in the same location

III-36



present office space exceeds
GSA standard 135 sq ft/person

space is adequate to handle present needs

NATIONAL CENTER FOR HEALTH STATISTICS

The National Center for Health Statistics (NCHS) facility is located on Davis Drive in the Research Triangle Park, approximately two miles from the Environmental Research Center. The EPA occupies about 25% of the NCHS facility, all within Building C.

BUILDING LEASED OR OWNED:

The EPA subleases space on a year-by-year basis from HHS, who is leasing the facility until October 31, 1988, form Capital Properties of Washington, D.C.

BUILDING DESCRIPTION AND DEFICIENCIES:

The space EPA occupies within the NCHS facility is probably the best designed space presently leased by EPA, and consists primarily of office space with related space for computer facilities, a conference room, a specialized library, a computer tape library, a weather communications and data recorder facility, and a meteorological outdoor platform and tower. Since the operations within the facility are computer oriented, most spaces are equipped for computer terminals and other computer related hardware.

There are no serious deficiencies in the existing facility based on its present use. There is, however, a potential asbestos exposure problem at NCHS. It is feared that asbestos dust is being circulated throughout the building through the mechanical system.

Code Violations

Since the facility was designed primarily for office use, the functions operated by EPA do not violate any building code requirements. The NCHS building is a protected steel frame structure which is unsprinklered. The frame is protected with an asbestos fiber compound.

Allocation of Space

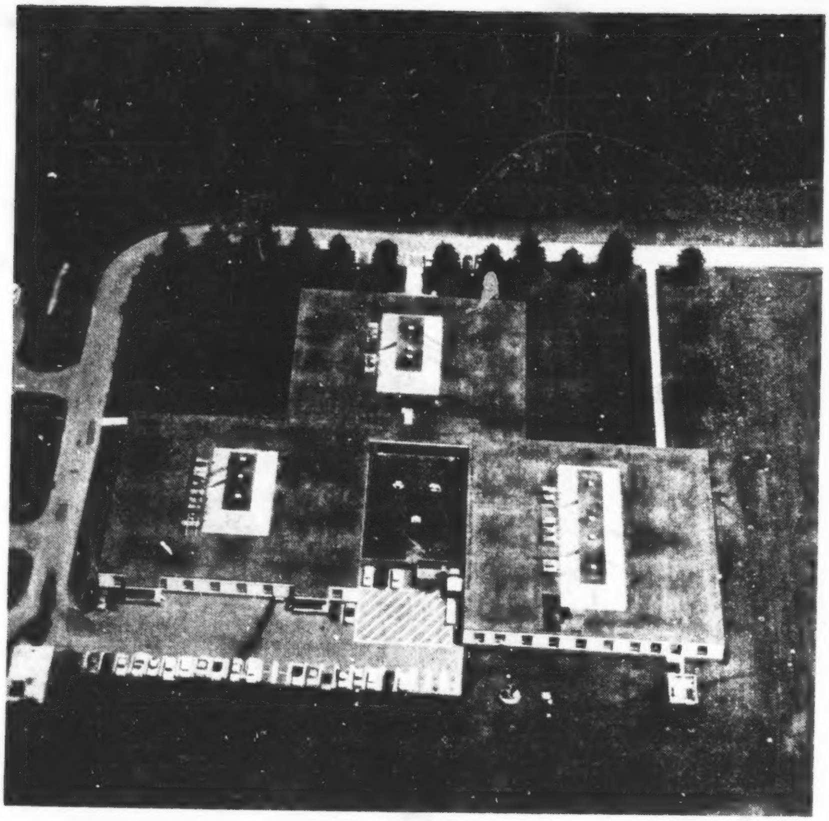
The Environmental Sciences Research Laboratory, ORD, occupies all of the EPA leased space within NCHS. ESRL presently occupies about 10,937 net square feet of space, with the Pesticides and Toxic Substances Branch and the Stationary Source Compliance Division (OAQPS) occupying about 755 net square feet for field offices. Counting the net space, such as private office corridors, the total net area leased by EPA is 14,836 square feet. The major disadvantage to the EPA facility at NCHS is the two mile distance from the main EPA facilities.

Lack of Space

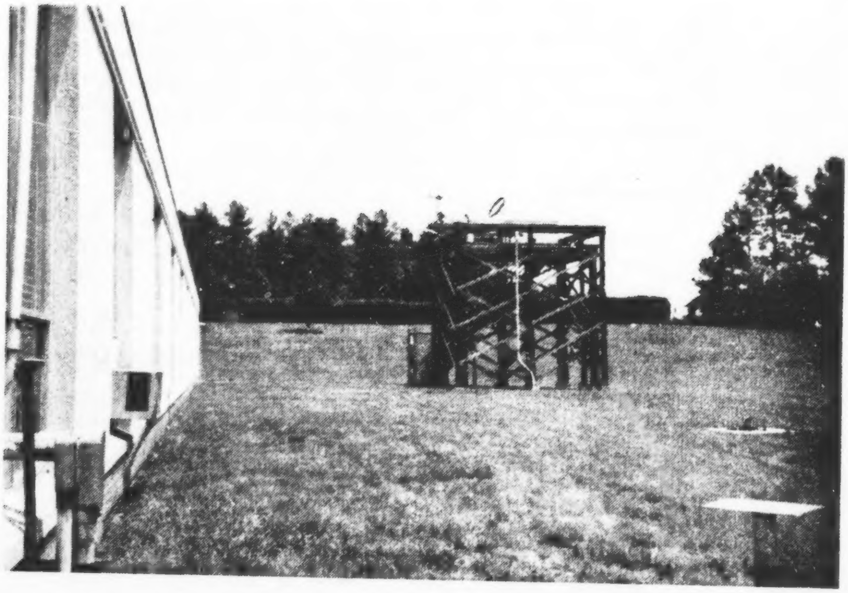
The NCHS facility is marginally sufficient based on the present space needs of ESRL; however, the facility cannot accommodate any increases in space needs for 1990, without leasing more space from HHS. Since HHS's lease expires in 1988, it is questionable that this facility will be available for use in 1990. Indeed, an interim facility may be needed after 1988 until a permanent facility can be provided to house these operations.

Mechanical and Electrical

No serious mechanical or electrical deficiencies were noted in the present facility. However, to meet future needs, computer network connections will be needed through coaxial cable link, fiber optics, and/or data phone. Special electrical provisions will be required due to the sensitivity of computer equipment to voltage transients and electrical noise. Individual controls for heating and air-conditioning will be required in all offices. A UPS system and special cooling system will be required for the main computer facility.



EPA Functions would be better suited in one consolidated location



meteorological tower

EMISSIONS MEASUREMENT LABORATORY

The Emission Measurement Laboratory (EML) is also located off Page Road and is adjacent to the Fluid Modeling Facility. This is just outside the Research Triangle Park.

BUILDING LEASED OR OWNED:

EML is being leased by the General Services Administration for OAQPS of EPA. The lease for this facility began on January 31, 1983 and expires on January 31, 1986.

BUILDING DESCRIPTION AND DEFICIENCIES:

General

The Emission Measurement Laboratory (EML), is a one-story "Butler Building" type structure of unprotected, noncombustible, unsprinklered construction. This building presently houses some office and laboratory space for OAQPS. The facility appears to be adequate for these functions. Structurally, the building had no problems noted.

Code Violations

There were no significant code violations noted in this building.

Space Allocation

There is approximately 7,163 square feet of space in this facility. OAQPS occupies 100 percent of the building and as mentioned earlier, houses laboratories and office space. The type of space is adequate for current and projected needs for OAQPS. The only problem noted was the distance away from other OAQPS functions.

Lack of Space

The building has an adequate amount of space to handle current and projected needs for this OAQPS laboratory function.

Electrical and Mechanical

No major deficiencies were noted with electrical or mechanical systems.

III-41

EML, Fluid Modeling Facility, and a warehouse not leased by EPA- location in main consolidated EPA Facility would be ideal

EML Facility should be closer to other OAQPS

III-42

adequate lab space

adequate service entrance

FLUID MODELING FACILITY

The Fluid Modeling Facility (Grand Slam Building) is located on Page Road in Durham County just outside of Research Triangle Park. The facility is directly beside the EML Building on the same site.

BUILDING LEASED OR OWNED:

This facility is presently being leased by the General Services Administration for EPA. The lease for this facility expires on April 30, 1987.

BUILDING DESCRIPTION AND DEFICIENCIES:

General

The fluid modeling Facility was originally built as the Grand Slam Racquet Club and has since been converted to handle the needs of the Meteorology Division of ESRL and for warehouse storage. The prefabricated type metal building now houses a variety of functions very unlike that of a tennis club that the building was originally designed for. This has created a few deficiencies within the facility. A converted loading dock is too small and functions poorly. Forklifts are also hard to use due to small pathways within the building. Storage racks also, cannot be utilized well due to incorrect lighting. Structurally, the building had no problems noted. Special foundations were, however, added to accommodate the large elevated water tanks.

Code Violations

The Fluid Modeling Facility is an unprotected, one story steel structure with a small mezzanine. The facility is classified as factory-industrial occupancy on one side and warehouse storage occupancy on the other. Currently, the areas between fire walls exceed the allowable areas according to the building codes for an unprotected, unsprinklered structure, 18,000 square feet is the maximum area between fire walls allowed by code. No other code violations were noted.

Space Allocation

This building provides ESRL with space for wind tunnels, a water channel/towing tank, shops, storage, tanks, computer facilities, office space and storage. There is also warehouse space on one end of the structure that is currently used by the General Services Division of the Office of Administration (18,248 square feet). With the research of ESRL being split up between four buildings (ERC, ERC Annex, NCHS, and Fluid Modeling Facility) there have naturally been some operation problems. Duplication of instruments, difficulty in supervision, commuting inefficiencies, and separation of experiments, are a few of the problems encountered with the present space allocation of FSRL programs. The Fluid Modeling Facility itself has a moderately sufficient organization of space. EPA has invested approximately $5,000,000.00 into this facility for the ESRL research. The facility, however, may be obsolete by 1990 if current needs change. Allocation of space at the Fluid Modeling Facility itself is not as much of a problem as the overall dispersement of ESRL throughout EPA.

Occupancy Totals

The following represents space allocated at this facility:

Organization	Net Total
OA/GSD (Warehouse)	18,248
ESRL	18,183

Lack of Space

The building presently has no deficiencies in space for this type of research. There is currently ample space of the wind tunnel and water channel studies. ESRL does, however, need space in other areas.

Electrical

Power:

Power is distributed to the building from a Duke Power owned 500 KVA transformer to EPA owned main distribution panelboard of 1200 amp capacity.

Maximum demand for the facility for the past year was 143 KW. Therefore, a sufficient amount of power is available for future and present needs.

Emergency Power:

A centralized emergency power source does not exist at the building. The need for such a source, however, was not identified.

Hazardous Area:

No problems were evident with hazardous conditions.

Life Safety:

The facility has smoke detectors throughout and emergency battery packs for egress lighting. No life safety deficiencies were identified.

Other Systems:

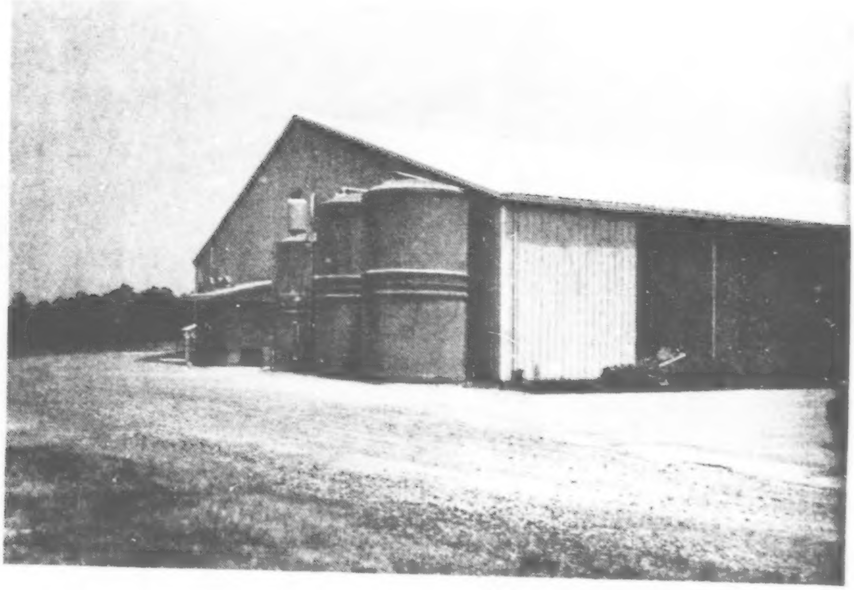
No deficiencies noted.

Mechanical

The present facility has adequate HVAC; however, it is not an energy efficient building.

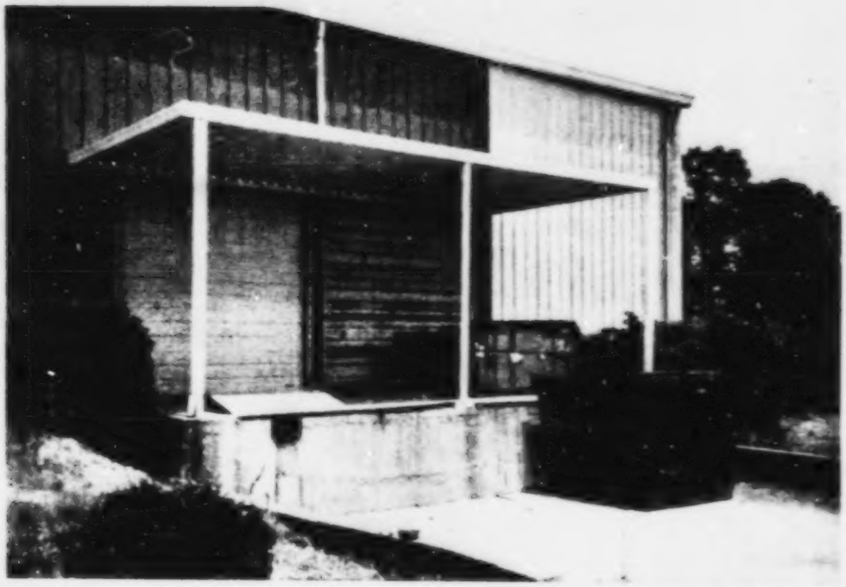
The water channel studies currently going on at this facility involve a great deal of saline water disposal periodically. The current building is not equipped to handle the treatment of this water. It is currently being drained into a nearby creek directly from the water channel.

Facility may be obsolete by 1990.
$5,000,000 has already been invested

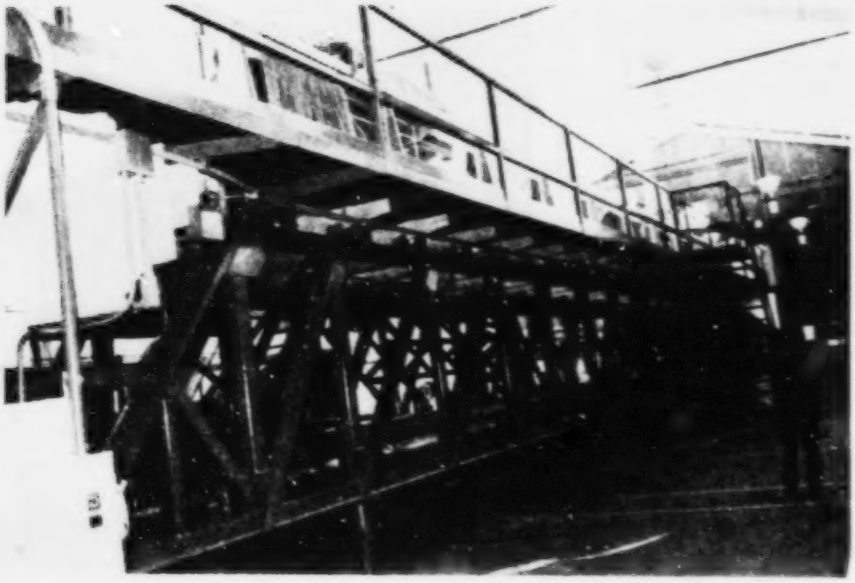


inadequate saline water treatment

III-46



small loading dock



water channel

CAMIO BUILDING

The Camio Building is a 1,783 net square feet facility for monitoring air pollution, located on South Mangum Street in Durham, North Carolina.

BUILDING LEASED OR OWNED:

The Camio Building is the only government owned building for EPA in the Research Triangle Park area.

BUILDING DESCRIPTION AND DEFICIENCIES:

The Camio Building is used for developing instrumentation, demonstrating new monitoring techniques, and training personnel. For accuracy in measurements, the facility must be located in an urban area where air pollution levels are higher, but should also be located near the main EPA facilities in the Research Triangle Park for easy access. The location in Durham on land leased from the City for one dollar a year is ideal for meeting both these requirements, and therefore, there is no need to relocate this facility in 1990.

Code Violations

The present facility is brick and block and unprotected steel frame construction, which meets applicable building codes for this size of a facility.

Allocation of Space

No personnel from any EPA laboratories are permanently housed in this facility at this time, although the facility is utilized from time to time by the Office of Research and Development laboratories.

Lack of Space

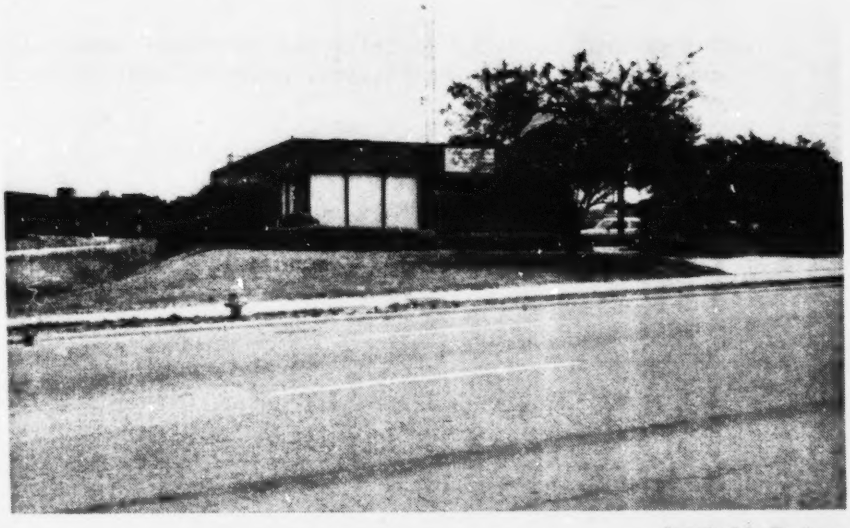
The Camio Facility has adequate space to meet its intended use now and for 1990.

Mechanical and Electrical

No mechanical or electrical deficiencies were noted at the Camio Facility.

III-48

seldom used Camio Facility



located in Durham

NORTH CAROLINA MUTUAL BUILDING

The North Carolina Mutual Building is an office building located in downtown Durham, North Carolina. The office of Air Quality Planning & Standards occupies a net area of 51,272 square feet on five floors within the Mutual Building, and is the only EPA component to occupy space there.

BUILDING LEASED OR OWNED?

Space within the North Carolina Mutual Building is leased through the General Services Administration (GSA). The current lease expires on July 31, 1985.

BUILDING DESCRIPTION AND DEFICIENCIES:

General

The space occupied by OAQPS in the North Carolina Mutual Building is primarily standard office space with permanent partitions and mostly individual offices. The Mutual Building is a well maintained building that adequately meets all of the present needs of OAQPS. There are no major deficiencies at present, although the present space does exceed the GSA requirement for a maximum of 135 square feet per person in office areas.

Code Violations

The North Carolina Mutual Building was originally designed as an office building; therefore no code violations were noted for the OAQPS operations.

Allocation of Space

The following divisions within OAQPS are located within the North Carolina Mutual Building:

Office of the Director:	6,329 square feet
Strategies and Air Standards Division:	9,000 square feet
Emission Standards and Engineering Division:	13,771 square feet
Monitoring and Data Analysis Division:	15,253 square feet
Control Programs Development Division:	6,919 square feet

The space within OAQPS includes standard office space, a library, a copy center, conference rooms, space for docket and other regulatory supporting files, a computer room and computer library, a common use area for word processors and computer terminals, and other support spaces. The only OAQPS function to be located outside of the North Carolina Mutual Building is the EML laboratory occupying 7,163 net square feet within other EPA facilities in the Research Triangle Park.

Unlike other EPA functions, OAQPS does not suffer adversely by being located away from the main EPA facilities in the Research

Triangle Park. The operations of OAQPS are more or less independent of the normal EPA-related research functions. However, some economic savings could be realized if OAQPS were located within a new permanent central EPA facility, especially in regards to savings in motor pool costs, phone costs, and savings in efficiency by sharing common use functions such as lobbies, cafeterias, libraries, and conference space.

Lack of Space

Even though the revised space and staff tables indicate an actual decrease of 546 net square feet for 1990 needs, the allocation of this space makes the decrease deceiving. Support spaces are actually showing a required increase by 1990; however, since the existing office space exceeds GSA requirements, the projected increase in personnel will be accommodated in fewer net square feet than at present. Since the existing facility houses individual offices within permanent-type gypsum drywall partitions, changing these facilities to reconfigure the space per GSA requirements would be disruptive to on-going operations and would result in significant downtime. It would be more practical to rearrange the space allocations to meet the GSA requirements if or when OAQPS moves into a new facility.

Mechanical and Electrical

No mechanical or electrical deficiencies were noted for the North Carolina Mutual Building.

space in Mutual Building is more than adequate for present requirements, although EPA consolidation is ideal

OTHER EPA/RTP OCCUPIED SPACE

JESTER ROAD STORAGE

This property is adjacent to the ERC and is a storage trailer park. The site is filled with numerous trailers of all types and houses chemicals, equipment, documents (i.e., Love Canal Study), etc. There are also a number of mobile Laboratories parked on the site. The property is predominantly used by ORD and is the responsibility of the Support Services Office. It is included under the ERC Lease Agreement.

ORD-SSO	14,712 S.F.

ALSTON AVENUE ROAD WAREHOUSE

This property is on Alston Avenue and is approximately one mile from ERC. The warehouse is used exclusively by the Animal Care Section of HERL for cart storage, etc. There are two loading areas in the rear of the building.

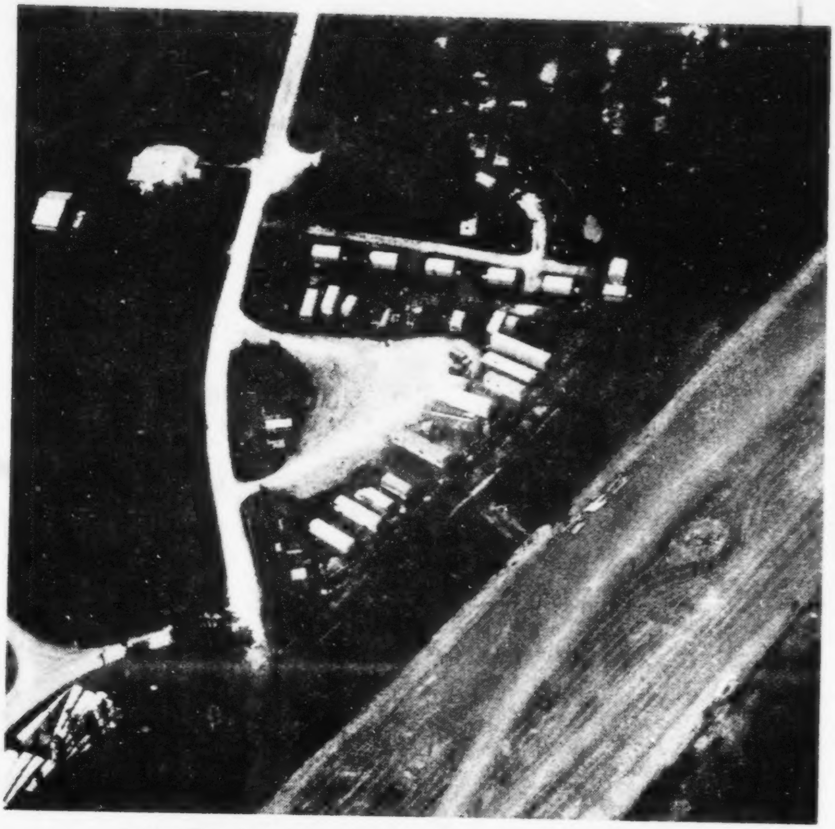
ORD-HERL	5,600 S.F.

OTHER MISCELLANEOUS OUTSIDE STORAGE

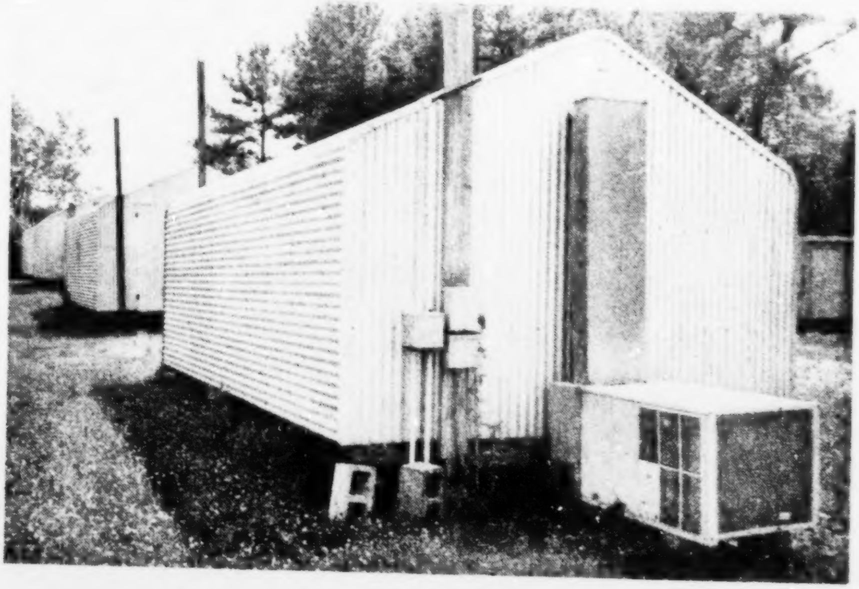
Includes fuel storage facilities, gas cylinder repositories, etc.

ORD-ESRL	10,985 S.F.
ORD-IERL	3,824 S.F.
	14,809 S.F.

III-53



Jester Road storage of mobile labs, chemicals, equipment, and misc.



inadequate storage

SUMMARY OF EVALUATION OF ALTERNATIVES FOR 1990

In identifying and evaluating alternatives for EPA for 1990, the assumption was made that every alternative would have approximately 623,812 net square feet, which is an increase of 79,240 net square feet over the existing area. Obviously, some of the alternatives solve only the needs for additional space without solving any of the other problems identified elsewhere in this report. Other alternatives consider having a new consolidated facility which could be designed around all of the specific requirements of EPA, therefore, making these alternatives more desirable. Each alternative has been described herein, including recommended timetables for implementing each alternative and life cycle costs associated with each alternative.

The cost analyses are based on the guidelines established by the Office of Management and Budget (OMB-Circular A-104) and include deflated costs expressed in "constant dollars" that are then discounted at 7 percent in one set of tables and 10 percent in another set of tables. OMB requires the use of the 7 percent discount factor in these calculations, and the 10 percent factor was used as a more realistic factor in today's market. The total costs presented are a total of the discounted costs over 20-years, which represents the total "present value" cost. The residual value represents the value of the site and improvements in 20-years, using the factors indicated in OMB Circular A-104 of 1.7 percent per year depreciation in value for buildings and 1.5 percent per year appreciation for the site.

Site Considerations:

With Alternative Numbers 2, 2A, 3, 4, 5 and 5A, where a new EPA facility is proposed, the proposed building site is a 44-acre tract of land designated for EPA, adjacent to the existing National Institute of Environmental Health Sciences (NIEHS). This property is part of a larger 509-acre tract of land in the Research Triangle Park called the U. S. Public Health Research Park, originally master planned for the National Environmental Health Sciences Center, the Environmental Protection Agency, centralized support facilities, and additional sites for future research facilities. The details of this Master Plan are included in a report prepared by A. G. Odell, Jr. and Associates and Smith, Hinchman and Grylls Associates, dated March 15, 1971.

The essence of this Master Plan is the siting of different agencies dealing with environmental health research in one research park where the missions and functions of the various agencies will compliment each other. This plan outlines an orderly arrangement of facilities in such a way that many support functions can be shared while allowing for maximum flexibility of facilities to accommodate future or changing program requirements. The Master Plan provides for a total support network consisting of roads, primary chilled water loop and high temperature hot water loop mains, loop water mains, sanitary sewer loops, fire protection system, electrical power substation and distribution system, refuse disposal and handling facilities, central utility plant, etc. This network can be used and extended as needed to accommodate a new EPA facility; for example, the piping loop systems have been sized to handle the anticipated future requirements of the central power plant, and the refuse disposal and handling facilities have been designed to allow for easy expansion to accommodate the master planned facilities. It would also be possible that certain functions and facilities could be shared between agencies if they could be made available on a reimbursement-for-use basis.

The Present Value Cost Analyses in this report indicate a figure of $60,000.00 per acre for the value of land in the Research Triangle Park. This figure represents the estimated land costs in 1990, and is achieved by escalating the present land values of approximately $40,000.00 per acre at 6 percent per year to 1990. Even though the site mentioned here is already government owned, the value of this property is included in the cost analyses as required by the guidelines of the OMB Circular A-104.

This building site has been chosen for consideration with these Alternatives because of its location in the Research Triangle Park and because of aforementioned master planning considerations and advantages. The figures for new construction costs and operating costs reflect the potential for savings associated with this site. Indeed, this master planned site is one of the main reasons why EPA should remain in the Research Triangle Park instead of building a consolidated facility elsewhere.

Considerations for the Toxicology and Microbiology Division of HERL Remaining in Cincinnati, Ohio:

The Toxicology and Microbiology Division of HERL is located in Cincinnati, Ohio. The facilities occupied by this division are government-owned and house offices, laboratories, animal facilities and various other special purpose space. There is presently adequate space at this facility and overcrowding is not a concern. There will, however, be a need for approximately 5,860 additional net square footage by 1990 at the present facility at an estimated $282.00 per net square foot cost, including fixed laboratory equipment. The cost for an addition to the Cincinnati location in 1990 would be approximately $1,652,520.00. On the other hand, a move to Research Triangle Park by Toxicology and Microbiology to consolidate HERL functions would require approximately 34,900 net square feet at a new facility. At an estimated $276.00 per net square foot at RTP this would cost approximately $9,632,400.00 for this new facility. This consolidation would also require moving people and equipment and would involve a massive disruption of ongoing programs in Cincinnati. The moving expense of 118 people (amount projected by 1990) from Cincinnati to Research Triangle Park would be about $1,770,000.00 which is $15,000.00 per person. Another cost that would be incurred is in moving equipment to the new site which at $2.60 a square foot would run approximately $80,000.00 in 1990. There are also other factors to consider in such an analysis. If a move to RTP were to take place, this would involve abandoning all their Cincinnati facilities. An animal care facility presently exists in Cincinnati for use by the Toxicology and Microbiology Division who is the only group utilizing such a facility in Cincinnati. Renovations of this and other abandoned space for some other government use would probably be necessary before it could be occupied again.

The total expenditure for the Toxicology and Microbiology Division to move from the Cincinnati location to RTP in 1990 would be approximately $11,482,400.00. Therefore, based on economic considerations alone, the move to RTP would be impractical.

Although consolidation of all HERL facilities would reduce the redundancies and inefficiencies between Toxicology and Microbiology and other HERL Divisions, a move would not be cost effective. At the present facility, being government-owned, changes, alterations and/or additions can easily be made to meet the existing or projected 1990 requirements of Toxicology and Microbiology.

COST COMPARISON

1990 (MOVE TO RTP)

Total Moving Expense		$ 1,850,000.00
New Building Cost		$ 9,632,400.00
	TOTAL	$11,482,400.00

1990 (REMAIN IN CINCINNATI)

Additional Space		$ 1,652,520.00
	TOTAL	$ 1,652,520.00

IV-4

Consideration for the Clinical Research Branch of the Inhalation Toxicology Division of HERL Remaining in Chapel Hill, North Carolina:

The Clinical Research Branch presently conducts research in conjunction with the School of Public Health and the School of Medicine at the University of North Carolina in Chapel Hill, North Carolina. This relationship must remain because of the technical expertise available to EPA from the Medical School, the availability of Consultants, and the availability of test subjects (students at the University of North Carolina). Even though a new facility is needed to remedy the extremely overcrowded conditions, and the University has plans to build a new facility for the Dental School on this site, any plans for a new facility should include a building site on or adjacent to the University of North Carolina Campus. This facility will be addressed in more detail in a separate study.

Recommended Alternatives:

The following pages indicate the various Alternatives studied to meet the needs of EPA by 1990. A summary of the related "present value" costs over a 20-year span has been included in the Executive Summary of this report, with the suggested ranking in priority for implementation by EPA. The conclusion of this study is that a new government-owned consolidated facility would not only best serve the interests of EPA, but is also the most cost effective alternative when considering initial costs and life cycle costs for the 20-year period studied. In terms of direct-government ownership of the facility, Alternative Nos. 3 and 5A offer the same advantages and their total life cycle costs are very similar. Alternative No. 3 has a lower total "present value" cost of approximately $205,580,000.00 compared to $223,745,000.00 for Alternative No. 5A. However, Alternative No. 5A requires an initial capital outlay of approximately $28,963,000.00 for A/E design costs and construction financing costs, compared to an initial capital outlay cost of $125,652,750.00 for Alternative No. 3. Odell Associates Inc. suggests that the recommended Alternative should be Alternative No. 3, but both 3 and 5A are viable Alternatives for a new EPA facility.

IV-5

COST OF EXISTING FACILITIES AND PROJECTED COSTS FOR 1990

BUILDING	TOTAL NET SQUARE FEET	LEASE COSTS PER YEAR	COST/ N.S.F.	UTILITY COSTS	MAINTENANCE COSTS	PROPERTY TAXES AND INSURANCE
Environmental Research Center	226,508	($ 3,241,000)	(12.16)	($2,188,980)		($ 95,200)-Additional taxes covered in lease
		4,797,144	18.00	$3,283,470		$142,800
E.R.C. Annex (Beaunit)	119,703 N.S.F.	($ 1,298,100)	(10.84)			--
		$ 1,945,174	16.25	($ 301,477)		
Administration Building (Beaunit)	38,537 N.S.F.	($ 508,000)**	(13.18)	$ 457,169		($ 57,600)
		$ 761,106	19.75			$ 86,600
Fluid Modeling Facility (Grandslam)	36,431 N.S.F.	($ 248,652)*	(6.82)	($ 58,893)		--
		$ 373,418	10.25	$ 88,339		
CAMIU Facility	1,783 N.S.F.	-0-(Gov't. owned)	-0-	($ 6,044)		--
				$ 9,066		
N.C. Mutual Building	51,272 N.S.F.	($ 453,381)**	(8.84)	--		--
		$ 820,352	16.00			
NCHS Building	14,836 N.S.F.	($ 168,198)	(11.34)	--		--
		$ 252,212	17.00			
EML Building	7,163 N.S.F.	($ 77,133)**	(10.77)	--		--
		$ 114,608	16.00			
Storage Trailers (Jester Road)	14,712 N.S.F.	-0-(Gov't. owned)	-0-	($ 12,743)		--
				$ 19,115		
Total Existing	553,928 N.S.F.	($ 5,994,464)		($2,568,107)	($2,011,100)	($152,800)
		$ 9,064,014		$3,852,159	$3,469,148	$229,400
Additional Space Projected for 1990	97,104 N.S.F.	$ 1,942,080		$ 853,544	$ 607,871	$ 40,214
Total for 1990	651,032 N.S.F.	$11,006,094		$4,705,703	$4,077,019	$269,614

NOTE: Several of the leased facilities listed above have operating and maintenance costs included in their leases and are, therefore, not itemized separately.

*Based on Standard Level Users Charge (SLUC), which is the amount that EPA pays GSA.

**These lease costs are GSA's costs where they exceed the SLUC rates. In these cases, the SLUC rates are not up-to-date, since they do not account for the latest GSA lease cost increases. The actual SLUC rates would exceed these GSA costs.

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EXISTING AND PROJECTED COSTS

ALTERNATIVES TO MEET 1990 NEEDS

ALTERNATIVE I

STAY IN EXISTING FACILITIES:

One option for 1990 is to stay in the existing buildings in the Research Triangle Park area by renegotiating the leases (or purchasing the existing buildings where possible) and continue the present policy of accommodating changing needs as they arise by leasing additional space elsewhere and making the needed modifications to the existing facilities. This alternative is based on the assumption that funding will not be available by 1990 to drastically improve the existing conditions and to accommodate the projected space needs.

This is not a viable alternative, since it does not meet the criteria established for a 1990 facility. In fact, if present trends continue, the crowded conditions and dispersement of functions throughout many buildings will only worsen. With this option, EPA would have to continue operating in unsafe conditions. Limitations on improvements due to the Economy Act of 1932 (for the renegotiated lease option) and the disruption to ongoing programs that would result if major improvements were made make this alternative unfeasible. The code deficiencies and poor relationships between the various EPA functions could not be adequately corrected with this alternative. Some studies on hazardous chemicals by 1990 at RTP could not be carried out with this alternative because of the facilities' limitations.

Even though, this alternative should not be considered as a viable option, the associated life cycle costs of this alternative are included in the Present Value Cost Analysis nonetheless as a basis of comparison for the other alternatives to determine how much more (or less) their costs would be relative to this option. For the purposes of the cost analysis, the costs associated with this alternative are based on leasing additional space in the Research Triangle Park area to meet the 1990 space needs.

ALTERNATIVE II

USE EXISTING AND NEW FACILITIES:

This alternative is based on using only the existing Environmental Research Center (either by renegotiating the lease or direct purchase) for EPA functions located in the Research Triangle Park area. In this and all other alternatives, the assumption is made that the small CAMIO facility should remain in Durham, North

Carolina, to accurately measure the affects of air pollution in an urban area. All of the Office of Research and Development (ORD) should move out of their existing facilities and into a new research facility which could adequately house these research functions according to the criteria established in this report. This new center would need to be approximately 651,858 gross square feet to meet the 1990 space needs. The vacated area within the Environmental Research Center facility could then be modified to meet the needs of OARM. and OAQPS. After these two EPA components occupy this renovated facility, their leases in their prior facilities would be terminated. Even though the existing Environmental Research Center cannot feasibly be altered to meet the code requirements for the hazardous research laboratories now occupying this space, it could easily be modified for administrative office space complying with all building code requirements. The square foot area of the existing research center actually exceeds the 326,261 gross square feet needed by OARM. and OAQPS combined.

The new research facility should be located on the 44-acre tract designated for EPA's use in the U.S. Public Health Research Park within the Research Triangle Park. This tract of land was actually master planned for EPA's use, and locating them adjacent to the National Institute of Environmental Health Sciences (NIEHS) would allow for consolidation of support facilities, therefore serving both functions more efficiently.

The new research center could be constructed as government-owned facility, a build/lease-back facility, or a build/lease/purchase facility. For the Present Value Cost Analysis, the assumption was made that this would be a government-owned facility. One disadvantage to this alternative is that it would not consolidate all EPA functions into one facility and would, therefore, result in inefficiencies and redundancies in their operations. However, this alternative would eliminate the building deficiencies which limit ORD's ability to carryout mandated research on hazardous chemicals.

ALTERNATIVE II-A

This alternative is the same as Alternative II, except the assumption has been made that EPA will purchase the Environmental Research Center for an amount equal to the estimated appraised value at that time.

ALTERNATIVE III

NEW GOVERNMENT-OWNED FACILITY:

This alternative would consist of a new facility of approximately 958,119 gross square feet, on the 44-acre tract of land in the U.S.

Public Health Research Park, which would consolidate all EPA functions in the Research Triangle Park. The obvious advantages to this scheme are the consolidation of all of EPA/RTP functions and having a government-owned facility which could be modified as needed to accommodate future redirections. Such modifications are not always possible with a leased facility because of the Economy Act limitations and the lack of control the government has over a leased facility. Also, with a government-owned facility, the EPA can maintain better control of the design and construction process.

With funding for a new facility coming from a government appropriation in lieu of having to finance or lease the project over 20-30 years, the cost savings over the life of the facility can be substantial, as indicated on the Present Value Cost Analysis.

ALTERNATIVE IV

BUILD/LEASE-BACK:

This alternative consists of having a new facility of approximately 958,119 gross square feet built by another party to the requirements of EPA and then leased back to EPA as a long-term lease. Presently, no government agency has authority to enter into this kind of agreement, so special legislation would be necessary authorizing this option. This option is similar to Alternative III with a new facility being built on the 44-acre tract to house all of EPA in the Research Triangle Park, except this alternative provides for a leased facility in lieu of a government-owned facility. The use of this site would, however, require that the government allow for a privately-owned facility to be built on government land by either leasing or selling the land to the building Owner. If this arrangement could not be made, then another site would have to be chosen probably at a greater cost to EPA. The advantages to the government funding approach over a lease agreement have been indicated under Alternative III; however, even though the total lease costs over the life of the building are higher than a one-time capital outlay expenditure, a large one-time government appropriation is not needed for a leased facility. With this option, the facility could be built and leased back by a private developer or possibly by the Research Triangle Park Foundation - Triangle Service Center, Inc., assuming a net-net-net lease agreement could be used (i.e., all operating and maintenance costs, taxes and insurance are paid for by EPA).

ALTERNATIVE V

BUILD/LEASE/PURCHASE:

With this alternative the conditions would be the same as the build/lease-back alternative for a facility of approximately 958,119 gross square feet, except the lease payments are credited towards the purchase price of the property. The lease agreement could be written so that the EPA would own the facility at the end of the lease period, or a balloon payment could be made at the end of the lease to pay off the balance of the purchase price. The 44-acre site mentioned above could be leased to the building Owner for a nominal sum for the term of the lease. The advantage to this approach is that no large initial government appropriation would be necessary, and the government would own the building when the lease expires. For the Present Value Cost Analysis, the assumption was made that part of the lease payments will be credited towards the purchase price so that the facility will be completely owned by the government at the end of the lease. As with the build/lease-back arrangement, this approach would require special legislative approval.

ALTERNATIVE V-A:

This alternative would be the same as Alternative V, except that the government would enter directly into a time-financed arrangement to amortize the cost of a new facility over a 20-year span. The improvements cost and associated "soft costs" for construction financing should be the same as Alternative V, but EPA would save on the management costs and profits that would ordinarily be passed on to the building Owner.

ALTERNATIVE VI

LEASE OTHER EXISTING FACILITIES:

This alternative assumes that other existing facilities are available in the Research Triangle Park area for lease (or purchase) to house a consolidated EPA facility. This is not a viable option because such a facility does not exist which even comes close to meeting the size and unique construction requirements for EPA.

PROPOSED SCHEDULES FOR IMPLEMENTATION

ALTERNATIVE NO. 2 AND 2A

PROJECT SCHEDULE FOR A NEW RESEARCH BUILDING

1. EPA to Develop Program of Requirements...January-August, 1985
2. EPA to Obtain FY-86 Appropriation for Planning A/E Fees..................October, 1985
3. EPA to Select A/E Firm and Award Contract.........................December, 1985
4. EPA to Obtain FY-87 Appropriation for Construction Funds.................October, 1986
5. A/E to Complete Design Documents.........March, 1987
6. EPA to Award Construction Contract.......June, 1987
7. Selected Contractor to Complete Construction...........................March, 1990
8. EPA to Complete Equipment Installation and Move into New Research Building....September, 1990

ALTERNATIVE NO. 3 AND 5A

PROJECT SCHEDULE FOR A NEW CONSOLIDATED GOVERNMENT-OWNED EPA FACILITY

1. EPA to Develop Program of Requirements...January-August, 1985

2. EPA to Obtain FY-86 Appropriation
   for Planning A/E Fees..................October, 1985

3. EPA to Select A/E Firm and
   Award Contract.........................December, 1985

4. A/E to Complete Design Documents.........September, 1987

5. EPA to Obtain FY-88 Appropriation
   for Construction Funds.................October, 1987
   (For 5A, EPA to Get Commitment
   for Construction and
   Permanent Financing)

6. EPA to Award Construction Contract.......December, 1987

7. Contractor to Complete Construction
   of New Facility........................March, 1990

8. EPA to Complete Equipment Installation
   and Move into New Facility.............March-September, 1990

ALTERNATIVE NOS. 4 AND 5

PROJECT SCHEDULE FOR A NEW CONSOLIDATED LEASED OR LEASE/PURCHASED EPA FACILITY

1. EPA to Develop Program of Requirements...January-August, 1985
2. EPA to Obtain FY-86 Appropriation for Planning A/E Fees..................October, 1985
3. EPA to Select A/E Firm and Award Contract.........................December, 1985
4. A/E to Complete Design Documents.........August, 1987
5. EPA to Complete Agreement with Developer, Start Construction..........November, 1987
6. Developer/Builder to Complete Construction of New Facility...........March, 1990
7. EPA to Complete Equipment Installation and Move into New Facility.............March-September, 1990

ALTERNATIVE NO. 1:

Stay in existing facilities, renegotiate the leases upon termination, and lease additional space to meet projected 1990 space needs.

Present Value Cost (With 7% Discount Factor)

ITEM	20 YEARS; 7%
Lease Cost	$116,598,550
Utility Cost	49,851,449
Repairs, Maintenance and Improvements	48,174,608
Property Taxes, Insurance	2,856,290
Total	217,480,897

Present Value Cost (With 10% Discount Factor)

ITEM	20 YEARS; 10%
Lease Cost	$93,595,813
Utility Cost	40,017,289
Repairs, Maintenance and Improvements	38,098,971
Property Taxes and Insurance	2,292,789
Total	$174,004,862

ALTERNATIVE NO. 1

ASSUMPTIONS:

1. The assumption was made that the 1990 renegotiated lease costs will be increased by 50% over the existing lease costs representing a lease increase of approximately 6% per year until 1990 for establishing the first year lease costs. This results in a first-year lease cost of $17.00/N.S.F. or about $11.49/G.S.F. These lease costs are lower than could be expected for a new facility, but seem reasonable for these existing facilities considering their present condition. An additional lease cost of $1,942,080. has been indicated for an additional 97,104 net square feet to meet the projected 1990 space needs. The assumption has been made that this space will be provided for in leased facilities at a rate of $20./N.S.F. or $13.00/G.S.F. for the first year. The assumption has been made that the leases will be renegotiated with the building Owners at an early enough date for EPA to negotiate a fair rent increase. Naturally, if EPA delays this negotiation until just before its leases expire, it will have no choice but to pay higher rents demanded by the Owners.

2. In these cost analyses, all lease costs are indicated as escalating leases with the yearly rates increased by a predetermined percentage of the Consumer Price Index (C.P.I.). It is impossible to determine what the Consumer Price Index will be from 1990-2010. The lease rates indicated are first year rates, which don't appreciably change in constant dollar terms over time since future rates increase in proportion to the C.P.I.

3. This alternative is based on the assumption that the buildings will continue to be occupied in their present state since it would not be feasible to attempt to correct the present deficiencies in these facilities with massive disruptions to on-going programs. The constant dollar costs for repairs, maintenance and improvements are shown increasing by 10% every five years because these deficiencies are likely to cause more and more hardships on EPA requiring greater expenses to make the necessary modifications.

ALTERNATIVE 1

ACTUAL YEARLY OUTLAYS IN "REAL DOLLARS"

YEAR*	LEASE COSTS	UTILITY COSTS	REPAIRS,MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE
1986				
1987				
1988				
1989				
1990				
1991	11,006,094	4,705,703	4,077,019	269,614
1992	11,666,459	4,988,045	4,321,640	285,790
1993	12,366,447	5,287,327	4,580,938	302,938
1994	13,108,434	5,604,567	4,855,794	321,114
1995	13,894,940	5,940,841	5,147,142	340,381
1996	14,728,636	6,297,292	5,455,971	360,804
1997	15,612,354	6,675,129	5,783,329	382,452
1998	16,549,095	7,075,637	6,130,329	405,399
1999	17,542,041	7,500,175	6,498,148	429,723
2000	18,594,564	7,950,186	6,888,037	455,507
2001	19,710,238	8,427,197	7,301,319	482,837
2002	20,892,852	8,932,829	7,739,398	511,807
2003	22,146,423	9,468,798	8,203,762	542,516
2004	23,475,208	10,036,926	8,695,988	575,067
2005	24,883,721	10,639,142	9,217,747	609,571
2006	26,376,744	11,277,491	9,770,812	646,145
2007	27,959,349	11,954,140	10,357,060	684,914
2008	29,636,910	12,671,388	10,978,484	726,009
2009	31,415,124	13,431,672	11,637,193	769,569
2010	33,300,032	14,237,572	12,335,425	815,743
TOTAL ACTUAL OUTLAYS	404,865,665	173,102,057	149,974,535	9,917,900

*Dates are for EPA fiscal years

ALTERNATIVE 1

PRESENT VALUE COST ANALYSIS 1990-2010

Constant Dollars

YEAR	LEASE COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE
0				
1	11,006,094*	4,705,703*	4,077,019*	269,614*
2	11,006,094*	4,705,703*	4,077,019*	269,614*
3	11,006,094*	4,705,703*	4,077,019*	269,614*
4	11,006,094*	4,705,703*	4,077,019*	269,614*
5	11,006,094*	4,705,703*	4,077,019*	269,614*
6	11,006,094*	4,705,703*	4,484,720*	269,614*
7	11,006,094*	4,705,703*	4,484,720*	269,614*
8	11,006,094*	4,705,703*	4,484,720*	269,614*
9	11,006,094*	4,705,703*	4,484,720*	269,614*
10	11,006,094*	4,705,703*	4,484,720*	269,614*
11	11,006,094*	4,705,703*	4,933,192*	269,614*
12	11,006,094*	4,705,703*	4,933,192*	269,614*
13	11,006,094*	4,705,703*	4,933,192*	269,614*
14	11,006,094*	4,705,703*	4,933,192*	269,614*
15	11,006,094*	4,705,703*	4,933,192*	269,614*
16	11,006,094*	4,705,703*	5,426,512*	269,614*
17	11,006,094*	4,705,703*	5,426,512*	269,614*
18	11,006,094*	4,705,703*	5,426,512*	269,614*
19	11,006,094*	4,705,703*	5,426,512*	269,614*
20	11,006,094*	4,705,703*	5,426,512*	269,614*
TOTAL UNDISCOUNTED COSTS IN CONSTANT DOLLARS	220,121,880	94,114,060	94,607,215	5,392,280

NOTE: THESE COSTS ARE BASED ON PRESENT COSTS PROJECTED TO 1990 DOLLARS. ALSO, THE LEASE COSTS REFLECTS AN ADDITIONAL 97,104 NET S.F. ADDED BY 1990 TO MEET PROJECTED NEEDS. THIS IS HIGHER THAN THE 79,060 NET S.F. PROJECTED INCREASE INDICATED IN THE SPACE AND STAFF TABLES, BECAUSE IT IS NOT FEASIBLE TO REARRANGE ALL OF THE EXISTING OFFICE SPACE TO COMPLY WITH GSA STANDARDS. THE LEASE COSTS ALSO ASSUME THAT LEASES EXPIRING ON OR BEFORE 1990 WILL BE RENEGOTIATED AT FAIR MARKET VALUES.

*NOTE: THE FIGURES ARE EXPRESSED IN "CONSTANT DOLLARS." THE ASSUMPTION HAS BEEN MADE THAT THE LEASE WILL BE AN ESCALATING LEASE TAGGED TO THE CONSUMER PRICE INDEX (C.P.I.). THE ASSUMPTION HAS ALSO BEEN MADE THAT THE OTHER ASSOCIATED COSTS WILL RISE BASED ON THE C.P.I. THESE FIGURES, THEREFORE, HAVE BEEN DEFLATED TO "CONSTANT DOLLARS" TERMS.

Present Value -7%

YEAR	7% DISCOUNT FACTOR	LEASE COST	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE
0	1.000				
1	.935	10,290,697	4,399,832	3,812,012	252,089
2	.873	9,608,320	4,108,078	3,559,237	235,373
3	.816	8,980,972	3,839,853	3,326,848	220,005
4	.763	8,397,649	3,589,688	3,110,765	205,715
5	.713	7,847,345	3,355,166	2,906,914	192,234
6	.666	7,330,058	3,133,998	2,986,823	179,563
7	.623	6,856,796	2,931,652	2,793,980	167,970
8	.582	6,405,546	2,738,719	2,610,107	156,915
9	.544	5,987,315	2,559,902	2,439,688	146,670
10	.508	5,591,095	2,390,497	2,278,238	136,964
11	.475	5,227,894	2,235,209	2,343,266	128,067
12	.444	4,886,705	2,089,332	2,190,337	119,709
13	.415	4,567,529	1,952,867	2,047,275	111,890
14	.388	4,270,364	1,825,812	1,914,078	104,610
15	.362	3,984,206	1,703,464	1,785,816	97,600
16	.339	3,731,065	1,595,233	1,839,588	91,399
17	.317	3,488,931	1,491,708	1,720,204	85,468
18	.296	3,257,803	1,392,888	1,606,248	79,806
19	.277	3,048,688	1,303,480	1,503,144	74,683
20	.258	2,839,572	1,214,071	1,400,040	69,560
	TOTAL PRESENT VALUE	116,598,550	49,851,449	48,174,608	2,856,290

IV-17

Present Value -10%

YEAR	10% DISCOUNT FACTOR	LEASE COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE
0	1.000				
1	.909	10,004,539	4,277,484	3,706,010	245,079
2	.826	9,091,033	3,886,910	3,367,617	222,701
3	.751	8,265,576	3,533,982	3,061,841	202,480
4	.683	7,517,162	3,213,995	2,784,603	184,146
5	.620	6,823,778	2,917,535	2,527,751	167,160
6	.564	6,207,437	2,654,016	2,529,382	152,062
7	.513	5,646,126	2,414,025	2,300,661	138,312
8	.466	5,128,839	2,192,857	2,089,878	125,640
9	.424	4,666,583	1,995,218	1,901,521	114,316
10	.385	4,237,346	1,811,695	1,726,617	103,801
11	.350	3,852,132	1,646,996	1,726,617	94,364
12	.318	3,499,937	1,496,413	1,568,755	85,737
13	.289	3,180,761	1,359,948	1,425,692	77,918
14	.263	2,894,602	1,237,599	1,297,429	70,908
15	.239	2,630,456	1,124,663	1,179,032	64,437
16	.217	2,388,322	1,021,137	1,177,553	58,506
17	.197	2,168,200	927,023	1,069,022	53,113
18	.179	1,970,090	842,320	971,345	48,260
19	.163	1,793,993	767,029	884,521	43,947
20	.148	1,628,901	696,444	803,123	39,902
	TOTAL PRESENT VALUE	93,595,813	40,017,289	38,098,971	2,292,789

IV-18

ALTERNATIVE NO. 2:

Construct a government-owned 651,858 gross square feet research building to house all of Office of Research and Development. Renovate and upfit vacated Environmental Research Center, renegotiate lease, and move all of O.A.Q.P.S. and O.A.R.M. into this facility. Terminate leases at other buildings (C.A.M.I.O. to remain in operation).

Present Value Cost (With 7% Discount Factor)

ITEM	20 YEARS; 7%
Improvements	100,413,000
Site	2,640,000
Upfit and Moving Cost	8,583,000
Lease Cost	50,820,931
Utility Cost	44,866,991
Repairs, Maintenance and Improvements	41,032,331
Taxes and Insurance	11,368,516
Subtotal	259,724,769
Less Residual Value	19,302,996
Total	240,421,773

Present Value Cost (With 10% Discount Factor)

ITEM	20 YEARS; 10%
Improvements	100,413,000
Site	2,640,000
Upfit and Moving Cost	8,583,000
Lease Cost	40,794,903
Utility Cost	36,015,559
Repairs, Maintenance and Improvements	32,937,412
Taxes and Insurance	9,125,716
Subtotal	230,509,590
Less Residual Value	11,073,036
Total	219,436,554

ALTERNATIVE NO. 2:

ASSUMPTIONS:

1. Improvements and Site Costs:

A new O.R.D. Research Building
631,858 G.S.F.
+20,000 G.S.F. (For auditorium, cafeteria,
651,858 G.S.F. lobby, etc. for O.R.D.)
Assume 1988 dollars for construction costs.
651,858 G.S.F. x $110./G.S.F. (base building cost)
= $71,704,380
Equipment Costs: Casework (assume 37 L.F. of laboratory casework per 220 S.F. lab)
= $75.00/S.F. of net lab space
Assume one fumehood for ever 300 S.F., at $30,000. each = $100./S.F.
Total equipment cost = $175./S.F. x 109,283 net lab space = $19,124,525
Environmental Chambers - 9 at $ 100,000 each
= $ 900,000
Site Improvements = $3,000,000
(grading, landscaping, parking, roads, etc.)
Subtotal = $94,728,905
Total A/E Fees @ 6% = $ 5,683,734
Total Improvements and Design Cost = $100,412,639
Value of Land (assume 44 acres @ $60,000/acre, 1990 cost)
= $ 2,640,000
Improvements - Say $100,413,000
Land - 2,640,000
Total = $103,053,000

2. ERC Renovation and Upfitting Costs:
173,003 Net S.F. O.R.D. space to be vacated in E.R.C. and upfitted for office space (including removal of casework and fumehoods)

Upfit Costs: 173,003 N.S.F. x $23./S.F.
= $3,979,069
Casework Removal (assume 37 L.F. per 220 S.F. lab)
= $3.36/N.S.F. of lab x 93,130 N.S.F.
= $312,917
Fume hood removal and roof patching
(assume $2,000 each, 300 N.S.F./hood)
$6.67/S.F. x 93,130 N.S.F. = $621,177
Total Upfit Cost = $4,913,163
Say $5,000,000

IV-21

3. Moving Costs:

Estimated cost to move O.R.D. to a new research facility (including moving furnishing and equipment) = $3,400,500. (1990 costs)

Estimated cost to move O.A.R.M. and O.A.Q.P.S. to renovated
E.R.C. Building = $182,716. (1990)
Total Moving Cost = $3,583,216
Say $3,583,000

4. Lease Termination Costs of other EPA facilities to be vacated: Assume facilities will be vacated and cleaned (moving costs), but buildings will be left in their existing conditions, with existing partitions, casework, etc. Therefore, termination costs are assumed to be zero. This, of course, is subject to negotiation between EPA and the building Owners.

5. Utility Costs: This alternative has a total of 660,623 net square feet compared to 651,032 net square feet for Alternative No. 1; therefore, the utility costs should be comparable in both schemes. However, by consolidating EPA into two facilities in place of the present conditions, a better electrical power rate will be available from Duke Power. Also, the new research building would be designed by today's energy conservation standards with a more efficient building envelope and mechanical and electrical system. Conservatively, a 10% savings could be realized in utility costs compared to Alternative No. 1.

The estimated utility costs would, therefore, be
$4,705,703. - 10% = $4,235,133

6. Repairs, Maintenance and Improvements: This alternative is based on the assumption that these costs will be 5% lower than in Alternative No. 1 for the first year, and these costs will remain constant (in constant dollars) through the twenty-year term being evaluated. This reduction in cost represents the approximate savings that can be expected by having a more consolidated facility and by having a new research building that would have lower repairs, maintenance and improvements cost than the existing research facilities.
$4,077,019. - 5% = $3,873,168.

7. Taxes and Insurance: The estimated tax rate after January 1, 1985, for this property will be 0.75/$100.00 based on the reassessment of property at that date. Based on the O.R.D. facility at $103,053,000. and the E.R.C. facility at $24,139,140. (402,319 G.S.F. x $60./S.F.), the property tax would be $953,940./year. Based on projected insurance rates (assuming insurance is not included in the E.R.C. lease), the cost of insurance in 1990 will be $119,170./year.

Total taxes and insurance = $1,073,110./year

ALTERNATIVE II

ACTUAL YEARLY OUTLAYS IN "REAL DOLLARS"

YEAR*	SITE IMPROVEMENTS FOR RESEARCH BLDG.	ERC UPFIT AND MOVING COSTS	ERC LEASE COSTS	UTILITY COSTS	REPAIRS MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	RESIDUAL VALUE
1986	2,000,000 (A/E Fees)						
1987	2,000,000 (A/E Fees)						
1988	32,137,545 (Construction and A/E Fees, Excluding Land Costs)						
1989	32,137,545 (Construction and A/E Fees, Excluding Land Costs)						
1990	32,137,545 (Construction and A/E Fees, Excluding Land Costs)	8,583,000					
1991			4,797,144	4,235,133	3,873,168	1,073,110	
1992			5,084,972	4,489,240	4,105,558	1,137,496	
1993			5,390,070	4,758,595	4,351,891	1,205,746	
1994			5,713,474	5,044,111	4,613,005	1,278,091	
1995			6,056,283	5,346,757	4,889,785	1,354,776	
1996			6,419,659	5,667,563	5,183,172	1,436,063	
1997			6,804,839	6,007,617	5,494,162	1,522,227	
1998			7,213,129	6,368,074	5,823,812	1,613,560	
1999			7,645,917	6,750,158	6,173,241	1,710,374	
2000			8,104,672	7,155,168	6,543,635	1,812,996	
2001			8,590,953	7,584,478	6,963,253	1,921,776	
2002			9,106,410	8,039,546	7,352,429	2,037,083	
2003			9,652,795	8,521,919	7,793,574	2,159,308	
2004			10,231,962	9,033,234	8,261,189	2,288,866	
2005			10,845,880	9,575,228	8,756,860	2,426,198	
2006			11,496,633	10,149,742	9,282,272	2,571,770	
2007			12,186,431	10,758,727	9,839,208	2,726,076	
2008			12,917,617	11,404,250	10,429,561	2,889,641	
2009			13,692,674	12,088,505	11,055,335	3,063,019	
2010			14,514,234	12,813,816	11,718,655	3,246,801	
TOTAL YEARLY OUTLAYS	100,412,635	8,583,000	176,465,748	155,791,861	142,476,765	39,474,977	74,817,812

*EPA FISCAL YEARS

ALTERNATIVE II

PRESENT VALUE COST ANALYSIS 1990-2010

Constant Dollars

YEAR	SITE IMPROVEMENTS FOR RESEARCH BLDG.	ERC UPFIT AND MOVING COSTS	ERC LEASE COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	RESIDUAL VALU
0	*103,053,000	**$8,583,000.					
1			4,797,144	4,235,133	3,873,168	1,073,110	
2			4,797,144	4,235,133	3,873,168	1,073,110	
3			4,797,144	4,235,133	3,873,168	1,073,110	
4			4,797,144	4,235,133	3,873,168	1,073,110	
5			4,797,144	4,235,133	3,873,168	1,073,110	
6			4,797,144	4,235,133	3,873,168	1,073,110	
7			4,797,144	4,235,133	3,873,168	1,073,110	
8			4,797,144	4,235,133	3,873,168	1,073,110	
9			4,797,144	4,235,133	3,873,168	1,073,110	
10			4,797,144	4,235,133	3,873,168	1,073,110	
11			4,797,144	4,235,133	3,873,168	1,073,110	
12			4,797,144	4,235,133	3,873,168	1,073,110	
13			4,797,144	4,235,133	3,873,168	1,073,110	
14			4,797,144	4,235,133	3,873,168	1,073,110	
15			4,797,144	4,235,133	3,873,168	1,073,110	
16			4,797,144	4,235,133	3,873,168	1,073,110	
17			4,797,144	4,235,133	3,873,168	1,073,110	
18			4,797,144	4,235,133	3,873,168	1,073,110	
19			4,797,144	4,235,133	3,873,168	1,073,110	
20			4,797,144	4,235,133	3,873,168	1,073,110	74,817,812
TOTAL UNDISCOUNTED COSTS IN CONSTANT DOLLARS	103,053,000	8,583,000	95,942,880	84,702,660	77,463,360	21,462,200	74,817,812

*IMPROVEMENTS COSTS AND DESIGN COSTS OF $100,413,000; PROPERTY COST (VALUE) OF $2,640,000.

**E.R.C. UPFITS OF $5,000,000; MOVING COST OF $3,583,000.

IV-23

Present Value -7%

YEAR	7% DISCOUNT FACTOR	SITE/IMPROVEMENTS FOR RESEARCH BLDG.	UPFIT AND MOVING COSTS	LEASE COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	TAXES AND INSURANCE	RESIDUAL VALUE
0	1.000	103,053,000	8,583,000					
1	.935			4,485,329	3,959,849	3,621,412	1,003,357	
2	.873			4,187,906	3,697,271	3,381,275	936,825	
3	.816			3,914,469	3,455,868	3,160,505	875,657	
4	.763			3,660,220	3,231,406	2,955,227	818,782	
5	.713			3,420,363	3,019,649	2,761,568	765,127	
6	.666			3,194,897	2,820,598	2,579,529	714,691	
7	.623			2,988,620	2,638,487	2,412,983	668,647	
8	.582			2,791,937	2,464,847	2,254,183	624,550	
9	.544			2,609,646	2,303,912	2,107,003	583,771	
10	.508			2,436,949	2,151,447	1,967,569	545,139	
11	.475			2,278,643	2,011,688	1,839,754	509,727	
12	.444			2,129,931	1,880,399	1,719,686	467,460	
13	.415			1,990,814	1,757,580	1,607,364	445,340	
14	.388			1,861,291	1,643,231	1,502,789	416,366	
15	.362			1,736,566	1,533,118	1,402,086	388,465	
16	.339			1,626,231	1,435,710	1,313,003	363,784	
17	.317			1,520,694	1,342,537	1,227,794	340,175	
18	.296			1,419,954	1,253,599	1,146,457	317,460	
19	.277			1,328,808	1,173,131	1,072,867	297,251	
20	.258			1,237,663	1,092,664	999,277	276,862	19,302,996
	TOTAL PRESENT VALUE	103,053,000	$8,583,000	50,820,931	44,866,991	41,032,331	11,368,516	19,302,996

Present Value -10%

YEAR	10% DISCOUNT FACTOR	SITE IMPROVEMENTS FOR RESEARCH BLDG.	UPFIT AND MOVING COSTS	LEASE COSTS	UTILITY COST	REPAIRS, MAINTENANCE AND IMPROVEMENTS	TAXES AND INSURANCE	RESIDUAL VALUE
0	1.000	103,053,000	8,583,000					
1	.909			4,360,603	3,849,735	3,520,709	975,456	
2	.826			3,962,440	3,498,219	3,199,236	886,388	
3	.751			3,602,655	3,180,584	2,908,749	805,905	
4	.683			3,276,449	2,892,595	2,645,373	732,934	
5	.620			2,974,229	2,625,782	2,401,364	665,328	
6	.564			2,705,589	2,388,615	2,184,466	605,234	
7	.513			2,460,934	2,172,623	1,986,935	550,505	
8	.466			2,235,469	1,973,571	1,804,896	500,069	
9	.424			2,033,989	1,795,696	1,642,223	454,998	
10	.385			1,846,900	1,630,526	1,491,169	413,147	
11	.350			1,679,000	1,482,296	1,355,608	375,588	
12	.318			1,525,491	1,346,772	1,231,667	341,248	
13	.289			1,386,374	1,223,953	1,119,345	310,128	
14	.263			1,261,648	1,113,839	1,018,643	282,227	
15	.239			1,146,517	1,012,196	925,687	256,473	
16	.217			1,040,980	919,023	840,477	232,864	
17	.197			945,037	834,321	763,014	211,402	
18	.179			858,688	758,088	693,297	192,086	
19	.163			781,934	690,326	631,326	174,916	
20	.148			709,977	626,799	573,228	158,820	11,073,036
	TOTAL PRESENT VALUE	103,053,000	8,583,000	40,794,903	36,015,559	32,937,412	9,125,716	11,073,036

ALTERNATIVE NO. 2A:

Construct a government-owned 651,858 gross square feet research building to house all of Office of Research and Development. Government purchase of Environmental Research Center. Renovate and upfit vacated space and move all of O.A.Q.P.S. and O.A.R.M. into this facility. Terminate leases at other buildings (C.A.M.I.O. to remain in operation).

Present Value Cost (With 7% Discount Factor)

ITEM	20 YEARS; 7%
Improvements	137,413,000
Site	5,580,000
Moving Cost	3,583,000
Utility Cost	44,866,991
Repairs, Maintenance and Improvements	41,032,331
Taxes and Insurance	11,368,516
Subtotal	243,843,838
Less Residual Value	27,099,316
Total	216,744,522

Present Value Cost (With 10% Discount Factor)

ITEM	20 YEARS; 10%
Improvements	137,413,000
Site	5,580,000
Moving Cost	3,583,000
Utility Cost	36,015,559
Repairs, Maintenance and Improvements	32,937,412
Taxes and Insurance	9,125,716
Subtotal	224,654,687
Less Residual Value	15,545,344
Total	209,109,343

ALTERNATIVE NO. 2A:

ASSUMPTIONS:

1. The costs of the new O.R.D. Research Building would be the same as Alternate 2:

same as Alternate 2:	$100,413,000
Land costs	2,640,000
Total	$103,053,000

2. The cost to purchase the Environmental Research Center, based on the anticipated appraised value:

on the anticipated appraised value:	$32,000,000
Land costs (49 acres x $60,000/acre)	= 2,940,000
Total	$34,940,000

3. ERC Renovation and Upfitting Costs:

(Note: this expense should be added to the total improvements cost)	$5,000,000
Total improvements and Site Costs	=$142,993,000

4. All other costs would be the same as in Alternate No. 2.

ALTERNATIVE IIA

ACTUAL YEARLY OUTLAYS IN "REAL DOLLARS"

YEAR*	SITE/IMPROVEMENTS	MOVING COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	RESIDUAL VALUE
1986	2,000,000 (A/E Fees)					
1987	2,000,000 (A/E Fees)					
1988	32,137,545 (Construction and A/E Fees, Excluding Land Costs)					
1989	32,137,545					
1990	72,077,545 (Construction and A/E Fees, Purchase of ERC and ERC Renovation Costs)	3,583,000				
1991			4,235,133	4,077,019	1,073,110	
1992			4,489,240	4,321,640	1,137,496	
1993			4,758,595	4,580,938	1,205,746	
1994			5,044,111	4,855,794	1,278,091	
1995			5,346,757	5,147,142	1,354,776	
1996			5,667,563	5,455,971	1,436,063	
1997			6,007,617	5,783,329	1,522,227	
1998			6,368,074	6,130,329	1,613,560	
1999			6,750,158	6,498,148	1,710,374	
2000			7,155,168	6,888,037	1,812,996	
2001			7,584,478	7,301,319	1,921,776	
2002			8,039,546	7,739,398	2,037,083	
2003			8,521,919	8,203,762	2,159,308	
2004			9,033,234	8,695,988	2,288,866	
2005			9,575,228	9,217,747	2,426,198	
2006			10,149,742	9,770,812	2,571,770	
2007			10,758,727	10,357,060	2,726,076	
2008			11,404,250	10,978,484	2,889,641	
2009			12,088,505	11,637,193	3,063,019	
2010			12,813,816	12,335,425	3,246,801	
TOTAL YEARLY OUTLAYS	140,352,635	3,583,000	155,791,861	149,975,535	39,474,977	105,036,109

*EPA FISCAL YEARS

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ALTERNATIVE II-A

PRESENT VALUE COST ANALYSIS 1990-2010

Constant Dollars

YEAR	SITE/IMPROVEMENTS	MOVING COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	TAXES AND INSURANCE	RESIDUAL VALUE
0	*142,993,000	**3,583,000.				
1			4,235,133	3,873,168	1,073,110	
2			4,235,133	3,873,168	1,073,110	
3			4,235,133	3,873,168	1,073,110	
4			4,235,133	3,873,168	1,073,110	
5			4,235,133	3,873,168	1,073,110	
6			4,235,133	3,873,168	1,073,110	
7			4,235,133	3,873,168	1,073,110	
8			4,235,133	3,873,168	1,073,110	
9			4,235,133	3,873,168	1,073,110	
10			4,235,133	3,873,168	1,073,110	
11			4,235,133	3,873,168	1,073,110	
12			4,235,133	3,873,168	1,073,110	
13			4,235,133	3,873,168	1,073,110	
14			4,235,133	3,873,168	1,073,110	
15			4,235,133	3,873,168	1,073,110	
16			4,235,133	3,873,168	1,073,110	
17			4,235,133	3,873,168	1,073,110	
18			4,235,133	3,873,168	1,073,110	
19			4,235,133	3,873,168	1,073,110	
20			4,235,133	3,873,168	1,073,110	
	142,993,000	3,583,000	84,702,660	77,463,360	21,462,200	105,036,109

*IMPROVEMENTS COSTS AND DESIGN COSTS OF $137,413,000; PROPERTY COST (VALUE) OF $5,580,000.

Present Value -7%

YEAR	7% DISCOUNT FACTOR	SITE IMPROVEMENTS FOR RESEARCH BLDG.	UPFIT AND MOVING COSTS	UTILITY COST	REPAIRS, MAINTENANCE AND IMPROVEMENTS	TAXES AND INSURANCE	RESIDUAL VALUE
0	1.000	142,993,000	3,583,000				
1	.935			3,959,849	3,621,412	1,003,357	
2	.873			3,697,271	3,381,275	936,825	
3	.816			3,455,868	3,160,505	875,657	
4	.763			3,231,406	2,955,227	818,782	
5	.713			3,019,649	2,761,568	765,127	
6	.666			2,820,598	2,579,529	714,691	
7	.623			2,638,487	2,412,983	668,547	
8	.582			2,464,847	2,254,183	624,550	
9	.544			2,303,912	2,107,003	583,771	
10	.508			2,151,447	1,967,569	545,139	
11	.475			2,011,688	1,839,754	509,727	
12	.444			1,880,399	1,719,686	476,460	
13	.415			1,757,580	1,607,364	445,340	
14	.388			1,643,231	1,502,789	416,366	
15	.362			1,533,118	1,402,086	388,465	
16	.339			1,435,710	1,313,003	363,784	
17	.317			1,342,537	1,227,794	340,175	
18	.296			1,253,599	1,146,457	317,640	
19	.277			1,173,131	1,072,867	297,251	
20	.258			1,092,664	999,277	276,862	27,099,316
	TOTAL PRESENT VALUE	142,993,000	3,583,000	44,866,991	41,032,331	11,368,516	27,099,316

Present Value -10%

YEAR	10% DISCOUNT FACTOR	SITE/IMPROVEMENTS	MOVING COSTS	UTILITY COST	REPAIRS, MAINTENANCE AND IMPROVEMENTS	TAXES AND INSURANCE	RESIDUAL VALUE
0	1.000	*142,993,000	**3,583,000.				
1	.909			3,849,735	3,520,709	975,456	
2	.826			3,498,219	3,199,236	886,388	
3	.751			3,180,584	2,908,749	805,905	
4	.683			2,892,595	2,645,373	732,934	
5	.620			2,625,782	2,401,364	665,328	
6	.564			2,388,615	2,184,466	605,234	
7	.513			2,172,623	1,986,935	550,505	
8	.466			1,973,571	1,804,896	500,069	
9	.424			1,795,696	1,642,223	454,998	
10	.385			1,630,526	1,491,169	413,147	
11	.350			1,482,296	1,355,608	375,588	
12	.318			1,346,772	1,231,667	341,248	
13	.289			1,223,953	1,119,345	310,128	
14	.263			1,113,839	1,018,643	282,227	
15	.239			1,012,196	925,687	256,473	
16	.217			919,023	840,477	232,864	
17	.197			834,321	763,014	211,402	
18	.179			758,088	693,297	192,086	
19	.163			690,326	631,326	174,916	
20	.148			626,799	573,228	158,820	15,545,344
	TOTAL PRESENT VALUE	142,993,000	3,583,000	36,015,559	32,937,412	9,125,716	15,545,344

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ALTERNATIVE NO. 3:

Construct a new government-owned facility of 958,119 gross square feet to consolidate all EPA components.

Present Value Cost (With 7% Discount Factor)

ITEM	20 YEARS; 7%
Improvements (New Building)	123,012,750
Site	2,640,000
Utility Cost	45,996,288
Repairs, Maintenance and Improvements	38,872,733
Property Taxes and Insurance	11,246,211
Moving Cost	3,583,000
Subtotal	225,350,982
Less Residual Value	23,441,010
Total	205,579,289

Present Value Cost (With 10% Discount Factor)

ITEM	20 YEARS; 10%
Improvements (New Building)	123,012,750
Site	2,640,000
Utility Cost	36,922,071
Repairs, Maintenance and Improvements	31,203,860
Property Taxes and Insurance	9,027,538
Moving Cost	3,583,000
Subtotal	206,389,219
Less Residual Value	13,446,780
Total	192,942,439

ALTERNATIVE NO. 3:

ASSUMPTIONS:

1. Improvements and Site Costs (1988 Construction Costs):

O.R.D. space = 631,858 G.S.F. x $110./S.F. = $69,504,380
Equipment Costs (Casework, Fumehoods)
109,283 N.S.F. of lab x 175/S.F. = $19,124,525
Environmental Chambers: 9 @ $100,000 = $ 900,000
OARM and OAQPS Space =
326,261 G.S.F. x $60./S.F. = $19,575,660
Extra for Computer Raised Floor Area
= 45,630 N.S.F. x $40./S.F. ($100/S.F. - 60/S.F.)
= $ 1,825,200
Extra for Cafeteria Construction and Equipment
(130/S.F. - 60/S.F. = 70/S.F.)
$70/S.F. x 16,000 S.F. = $ 1,120,000

Site Improvements (grading and landscaping, parking and roads)
= $ 4,000,000

Total Construction Cost = $116,049,765
A/E Fees @ 6% = $ 6,962,985

Total Improvements and Design Costs = $123,012,750
Value of Land (assume 44 acres @ $60,000/acre, 1990 costs)
= $ 2,640,000
Total Improvements, Design Costs, and Site Costs
= $125,652,750

2. Utility Costs:

Existing buildings (excluding Mutual, NCHS, and EML) have a yearly utility cost of $8.19 for 574,778 N.S.F. (1990 costs). By consolidating all of EPA/RTP into one facility, a lower electrical power rate will be available from Duke Power. Also, the new facility would be designed by today's energy conservation standards with a more efficient building envelope and mechanical and electrical system. Conservatively, a 15% savings could be realized in utility costs compared to Alternate One.
$8.19/S.F. - 15% = $6.96/N.S.F.
$6.96/N.S.F. x 623,812 N.S.F. = $ 4,341,731

3. Repairs, Maintenance and Improvements:

This alternative is based on the assumption that these costs will be 10% lower than in Alternative No. 1 for the first year, and these costs will remain constant (in constant dollars) through the twenty-year term being evaluated. The 10% reduction in costs represents the approximate savings that can be expected by having a new consolidated facility that would have lower repairs, maintenance, and improvements costs.

$4,077,019 - 10% = $ 3,669,317

4. Property Taxes and Insurance:

Taxes: .75/$100.00 x $125,652,750 = $ 942,395

Insurance: 119,170

Total = $ 1,061,565

5. Moving Costs: $3,589,000

Cost to move furnishings and equipment to new facility, including the cost to disassemble and reassemble all research equipment. These costs were determined by the appropriate EPA personnel and by moving companies. Costs are projected in 1990 dollars.

ALTERNATIVE III

ACTUAL YEARLY OUTLAYS IN "REAL DOLLARS"

YEAR*	IMPROVEMENTS/SITE	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
1986	2,500,000 (A/E Fees)					
1987	2,500,000 (A/E Fees)					
1988	39,337,583 (A/E Fees and Construction Payments)					
1989	39,337,583 (A/E Fees and Construction Payments)					
1990	39,337,583 (A/E Fees and Construction Payments)					
1991		4,341,731	3,669,317	1,061,565	3,583,000	
1992		4,602,234	3,889,476	1,125,258		
1993		4,878,368	4,122,844	1,192,774		
1994		5,171,071	4,370,215	1,264,340		
1995		5,481,335	4,910,373	1,340,201		
1996		5,810,215	5,204,996	1,420,613		
1997		6,158,828	5,517,296	1,505,850		
1998		6,528,358	5,848,333	1,596,201		
1999		6,920,059	6,199,233	1,691,973		
2000		7,335,263	6,571,187	1,793,491		
2001		7,775,378	6,965,459	1,901,101		
2002		8,241,901	7,383,386	2,015,167		
2003		8,736,415	7,826,389	2,136,077		
2004		9,260,600	8,295,973	2,264,241		
2005		9,816,236	8,793,731	2,400,096		
2006		10,405,210	9,321,355	2,544,102		
2007		11,029,523	9,880,636	2,696,748		
2008		11,691,295	10,473,475	2,858,553		
2009		12,392,772	11,101,883	3,030,066		
2010		13,136,339	11,767,996	3,211,870		
TOTAL YEARLY OUTLAYS	123,012,749	159,713,131	142,113,553	39,050,287	3,583,000	90,856,628

*EPA FISCAL YEARS

ALTERNATIVE III

PRESENT VALUE COST ANALYSIS 1990-2010

Constant Dollars

YEAR	IMPROVEMENTS/SITE	UTILITY COSTS	REPAIR, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
0	125,652,750*					
1		4,341,731	3,669,317	1,061,565	3,583,000	
2		4,341,731	3,669,317	1,061,565		
3		4,341,731	3,669,317	1,061,565		
4		4,341,731	3,669,317	1,061,565		
5		4,341,731	3,669,317	1,061,565		
6		4,341,731	3,669,317	1,061,565		
7		4,341,731	3,669,317	1,061,565		
8		4,341,731	3,669,317	1,061,565		
9		4,341,731	3,669,317	1,061,565		
10		4,341,731	3,669,317	1,061,565		
11		4,341,731	3,669,317	1,061,565		
12		4,341,731	3,669,317	1,061,565		
13		4,341,731	3,669,317	1,061,565		
14		4,341,731	3,669,317	1,061,565		
15		4,341,731	3,669,317	1,061,565		
16		4,341,731	3,669,317	1,061,565		
17		4,341,731	3,669,317	1,061,565		
18		4,341,731	3,669,317	1,061,565		
19		4,341,731	3,669,317	1,061,565		
20		4,341,731	3,669,317	1,061,565		90,856,628**
	125,652,750	86,834,620	73,386,340	21,231,300	3,583,000	90,856,628

Present Value - 7%

YEAR	7% DISCOUNT FACTOR	IMPROVEMENTS/SITE	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
0	1.000	125,652,750				3,583,000	
1	.935		4,059,518	3,430,811	992,563		
2	.873		3,790,331	3,203,313	926,746		
3	.816		3,542,852	2,994,162	866,237		
4	.763		3,312,740	2,799,688	809,974		
5	.713		3,095,654	2,616,223	756,895		
6	.666		2,891,592	2,443,765	707,002		
7	.623		2,704,898	2,285,984	661,354		
8	.582		2,526,887	2,135,542	617,830		
9	.544		2,361,901	1,996,108	577,491		
10	.508		2,205,599	1,864,013	539,275		
11	.475		2,062,322	1,742,925	504,243		
12	.444		1,927,728	1,629,176	471,334		
13	.415		1,801,818	1,522,766	440,549		
14	.388		1,684,591	1,423,694	411,887		
15	.362		1,571,706	1,328,292	384,286		
16	.339		1,471,846	1,243,898	359,870		
17	.317		1,376,328	1,163,173	336,516		
18	.296		1,285,152	1,086,117	314,223		
19	.277		1,202,659	1,016,400	294,053		
20	.258		1,120,166	946,638	273,883		23,441,010
	TOTAL PRESENT VALUE	125,652,750	45,996,288	38,872,733	11,246,211	3,583,000	23,441,010

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Present Value - 10%

YEAR	10% DISCOUNT FACTOR	IMPROVEMENT/SITE	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
0	1.000	125,652,750				3,583,000	
1	.909		3,946,663	3,335,409	964,962		
2	.826		3,586,269	3,030,855	876,852		
3	.751		3,260,639	2,755,657	797,235		
4	.683		2,96[illegible],402	2,506,143	725,048		
5	.620		2,691,873	2,274,976	658,170		
6	.564		2,448,736	2,069,494	598,722		
7	.513		2,227,308	1,882,359	544,582		
8	.466		2,023,246	1,709,901	494,689		
9	.424		1,840,893	1,555,790	450,103		
10	.385		1,671,566	1,412,687	408,702		
11	.350		1,519,605	1,284,260	371,547		
12	.318		1,380,670	1,166,842	337,577		
13	.289		1,254,760	1,060,432	306,792		
14	.263		1,141,875	965,030	279,191		
15	.239		1,037,673	876,966	253,714		
16	.217		942,155	796,241	230,359		
17	.197		855,321	722,855	209,128		
18	.179		777,169	656,807	190,020		
19	.163		707,702	598,098	173,035		
20	.148		642,576	543,058	157,111		13,446,780
	TOTAL PRESENT VALUE	125,652,750	36,922,071	31,203,860	9,027,539	3,583,000	13,446,780

IV-38

ALTERNATIVE NO. 4:

Have a new consolidated 958,119 gross square feet facility built and leased back to EPA for a long-term net-net-net lease.

Present Value Cost (With 7% Discount Factor)

ITEM	20 YEARS; 7%
Total Lease Payments	$265,909,400
Utility Cost	45,996,288
Repairs, Maintenance and Improvements	38,872,713
Property Taxes and Insurance	11,246,211
Moving Cost	3,583,000
Total	$365,607,612

Present Value Cost (With 10% Discount Factor)

ITEM	20 YEARS; 10%
Total Lease Payments	$213,450,400
Utility Cost	36,922,071
Repairs, Maintenance and Improvements	31,203,860
Property Taxes and Insurance	9,027,539
Moving Cost	3,583,000
Total	$294,186,870

ALTERNATIVE NO. 4:

ASSUMPTIONS:

1. Lease cost is based on a new facility with same costs as in Alternative No. 3.

Total Improvements and Design Costs	= $123,012,750
Value of Property	= 2,640,000
Construction Loan Interest and other "soft" costs associated with constructing a new facility	= 22,000,000
Total	= $147,652,750

The lease cost for this facility was determined after studying the comparable lease rates within the Research Triangle Park area, the anticipated rate of return expected by the investors, the anticipated management costs associated with the lease, and the anticipated financing that might be available in 1990. These lease rates are based on a net-net-net lease where EPA pays for all operating and maintenance costs, taxes and insurance. Based on these factors, the anticipated first year lease for an escalating type, long-term lease (where the escalation is based on a percentage of the Consumer Price Index) would be 16% to 18% of the total project cost for this type of special-use facility. Assuming 17%: $147,652,750 x .17 = $25,100,967 per year (say $25,100,000) which equates to $26.20/S.F. per year in 1990 costs.

2. The costs of utilities, repairs, maintenance and improvements, taxes and insurance, and moving costs are assumed to be the same as in Alternative No. 3.

ALTERNATIVE IV

ACTUAL YEARLY OUTLAYS IN "REAL DOLLARS"

YEAR*	LEASE COSTS**	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS
1986					
1987					
1988					
1989					
1990					
1991	25,100,000	4,341,731	3,669,317	1,061,565	3,583,000
1992	26,606,000	4,602,234	3,889,476	1,125,258	
1993	28,202,360	4,878,368	4,122,844	1,192,774	
1994	29,894,501	5,171,071	4,370,215	1,264,340	
1995	31,688,171	5,481,335	4,910,373	1,340,201	
1996	33,589,461	5,810,215	5,204,996	1,420,613	
1997	35,604,828	6,158,828	5,517,296	1,505,850	
1998	37,741,118	6,528,358	5,848,333	1,596,201	
1999	40,005,585	6,920,059	6,199,233	1,691,973	
2000	42,405,920	7,335,263	6,571,187	1,793,491	
2001	44,950,276	7,775,378	6,965,459	1,901,101	
2002	47,647,292	8,241,901	7,383,386	2,015,167	
2003	50,506,130	8,736,415	7,826,389	2,136,077	
2004	53,536,498	9,260,600	8,295,973	2,264,241	
2005	56,748,687	9,816,236	8,793,731	2,400,096	
2006	60,153,609	10,405,210	9,321,355	2,544,102	
2007	63,762,825	11,029,523	9,880,636	2,696,748	
2008	67,588,595	11,691,295	10,473,475	2,858,553	
2009	71,643,911	12,392,772	11,101,883	3,030,066	
2010	75,942,545	13,136,339	11,767,996	3,211,870	
TOTAL YEARLY OUTLAYS	923,318,312	159,713,131	142,113,553	39,050,287	3,583,000

*EPA FISCAL YEARS

**THIS ALTERNATIVE ASSUMES THAT A/E FEES AND LAND COSTS ARE ALSO INCLUDED IN LEASE COSTS, AND THAT THE DEVELOPER CARRIES ALL COSTS INCURRED WITH PROJECT (A/E FEES, CONSTRUCTION LOAN INTEREST CHARGES, ETC.)

ALTERNATIVE IV

PRESENT VALUE COST ANALYSIS 1990-2010

Constant Dollars

YEAR	LEASE COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS
0	25,100,000	4,341,731	3,669,317	1,061,565	3,583,000
1	25,100,000	4,341,731	3,669,317	1,061,565	
2	25,100,000	4,341,731	3,669,317	1,061,565	
3	25,100,000	4,341,731	3,669,317	1,061,565	
4	25,100,000	4,341,731	3,669,317	1,061,565	
5	25,100,000	4,341,731	3,669,317	1,061,565	
6	25,100,000	4,341,731	3,669,317	1,061,565	
7	25,100,000	4,341,731	3,669,317	1,061,565	
8	25,100,000	4,341,731	3,669,317	1,061,565	
9	25,100,000	4,341,731	3,669,317	1,061,565	
10	25,100,000	4,341,731	3,669,317	1,061,565	
11	25,100,000	4,341,731	3,669,317	1,061,565	
12	25,100,000	4,341,731	3,669,317	1,061,565	
13	25,100,000	4,341,731	3,669,317	1,061,565	
14	25,100,000	4,341,731	3,669,317	1,061,565	
15	25,100,000	4,341,731	3,669,317	1,061,565	
16	25,100,000	4,341,731	3,669,317	1,061,565	
17	25,100,000	4,341,731	3,669,317	1,061,565	
18	25,100,000	4,341,731	3,669,317	1,061,565	
19	25,100,000	4,341,731	3,669,317	1,061,565	
20	25,100,000	4,341,731	3,669,317	1,061,565	
	502,000,000	86,834,620	73,386,340	21,231,300	3,583,000

Present Value - 7%

YEAR	7% DISCOUNT FACTOR	LEASE COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS
0	1.000					3,583,000
1	.935	23,468,500	4,059,518	3,430,811	992,563	
2	.873	21,912,300	3,790,331	3,203,313	926,746	
3	.816	20,481,600	3,542,852	2,994,162	866,237	
4	.763	19,151,300	3,312,740	2,799,668	809,974	
5	.713	17,896,300	3,095,654	2,616,223	756,895	
6	.666	16,716,600	2,891,592	2,443,765	707,002	
7	.623	15,637,300	2,704,898	2,285,984	661,354	
8	.582	14,608,200	2,526,887	2,135,542	617,830	
9	.544	13,654,400	2,361,901	1,996,108	577,491	
10	.508	12,750,800	2,205,599	1,864,013	539,275	
11	.475	11,922,500	2,062,322	1,742,925	504,243	
12	.444	11,144,400	1,927,728	1,629,176	471,334	
13	.415	10,416,500	1,801,818	1,522,766	440,549	
14	.388	9,738,800	1,684,591	1,423,694	411,887	
15	.362	9,086,200	1,571,706	1,328,292	384,286	
16	.339	8,508,900	1,471,846	1,243,898	359,870	
17	.317	7,956,700	1,376,328	1,163,173	336,516	
18	.296	7,429,600	1,285,152	1,086,117	314,223	
19	.277	6,952,700	1,202,659	1,016,400	294,053	
20	.258	6,475,800	1,120,166	946,683	273,883	
	TOTAL PRESENT VALUE	265,909,400	45,996,288	38,872,713	11,246,211	3,583,000

Present Value 10%

YEAR	10% DISCOUNT FACTOR	LEASE COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS
0	1.000					3,583,000
1	.909	22,815,900	3,946,633	3,335,409	964,962	
2	.826	20,732,600	3,586,269	3,030,855	876,852	
3	.751	18,850,100	3,260,639	2,755,657	797,235	
4	.683	17,143,300	2,965,402	2,506,143	725,048	
5	.620	15,562,000	2,691,873	2,274,976	658,170	
6	.564	14,156,400	2,448,736	2,069,494	598,722	
7	.513	12,876,300	2,227,308	1,882,359	544,582	
8	.466	11,696,600	2,023,246	1,709,901	494,689	
9	.424	10,642,400	1,840,893	1,555,790	450,103	
10	.385	9,663,500	1,671,566	1,412,687	408,702	
11	.350	8,785,000	1,519,605	1,284,260	371,547	
12	.318	7,981,800	1,380,670	1,166,842	337,577	
13	.289	7,253,900	1,254,760	1,060,432	306,792	
14	.263	6,601,300	1,141,875	965,030	279,191	
15	.239	5,998,900	1,037,673	876,966	253,714	
16	.217	5,446,700	942,155	796,241	230,359	
17	.197	4,944,700	855,321	722,855	209,128	
18	.179	4,492,900	777,169	656,807	190,020	
19	.163	4,091,300	707,702	598,098	173,035	
20	.148	3,714,800	642,576	543,058	157,111	
	TOTAL PRESENT VALUE	213,450,400	36,922,071	31,203,860	9,027,539	3,583,000

ALTERNATIVE NO. 5:

Have a new consolidated 958,119 gross square feet facility built, then leased back to EPA with a lease/purchase agreement so that EPA would own the facility at the expiration of the lease period.

Present Value Cost (With 7% Discount Factor)

ITEM	20 YEARS; 7%
Total Lease/Purchase Payments	265,909,400
Utility Cost	45,996,288
Repairs, Maintenance and Improvements	38,872,713
Property Taxes and Insurance	11,246,211
Moving Costs	3,583,000
Subtotal	365,607,612
Less Residual Value	23,441,010
Total	342,166,602

Present Value Cost (With 10% Discount Factor)

ITEM	20 YEARS; 10%
Total Lease/Purchase Payments	213,450,400
Utility Cost	36,922,071
Repairs, Maintenance and Improvements	31,203,860
Property Taxes and Insurance	9,027,539
Moving Costs	3,583,000
Subtotal	294,456,870
Less Residual Value	13,446,780
Total	281,010,090

ALTERNATIVE NO. 5

ASSUMPTIONS:

1. This analysis is based on having the lease payments credited towards the purchase of a new facility. At the end of the twenty-year term, the facility would be owned by EPA without any additional payments.

2. Due to the special-purpose use of this facility, the risks to an investor arranging this lease/purchase would be less than with a straight lease agreement. Also, if EPA decided not to renegotiate their lease after twenty years with the straight lease option, the investors or developers would be left with a highly specialized complex that would be difficult to lease. For these reasons, all real estate investors that were consulted during this evaluation stated that the lease/purchase payments would probably not vary significantly from the straight lease payments identified in Alternative No. 4. The assumption has been made, therefore, that the lease/purchase payments will also be 17% of the building cost for the first years lease, with the payments escalating based on the Consumer Price Index, as in Alternative No. 4.

3. All operating and maintenance costs were assumed to be the same as in Alternative Nos. 3 and 4.

ALTERNATIVE V

ACTUAL YEARLY OUTLAYS IN "REAL DOLLARS"

YEAR*	LEASE/PURCHASE COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
1986						
1987						
1988						
1989						
1990						
1991	25,100,000	4,341,731	3,669,317	1,061,565	3,583,000	
1992	26,606,000	4,602,234	3,889,476	1,125,258		
1993	28,202,360	4,878,368	4,122,844	1,192,774		
1994	29,894,501	5,171,071	4,370,215	1,264,340		
1995	31,688,171	5,481,335	4,910,373	1,340,201		
1996	33,589,461	5,810,215	5,204,996	1,420,613		
1997	35,604,828	6,158,828	5,517,296	1,505,850		
1998	37,741,118	6,528,358	5,848,333	1,596,201		
1999	40,005,585	6,920,059	6,199,233	1,691,973		
2000	42,405,920	7,335,263	6,571,187	1,793,491		
2001	44,950,276	7,775,378	6,965,459	1,901,101		
2002	47,647,292	8,241,901	7,383,386	2,015,167		
2003	50,506,130	8,736,415	7,826,389	2,136,077		
2004	53,536,498	9,260,600	8,295,973	2,264,241		
2005	56,748,687	9,816,236	8,793,731	2,400,096		
2006	60,153,609	10,405,210	9,321,355	2,544,102		
2007	63,762,825	11,029,523	9,880,636	2,696,748		
2008	67,588,595	11,691,295	10,473,475	2,858,553		
2009	71,643,911	12,392,772	11,101,883	3,030,066		
2010	75,942,545	13,136,339	11,767,996	3,211,870		
TOTAL YEARLY OUTLAYS	923,318,312	159,713,131	142,113,553	39,050,287	3,583,000	90,856,628

*EPA FISCAL YEARS

**THIS ALTERNATE ASSUMES THAT A/E FEES AND LAND COSTS ARE ALSO INCLUDED IN LEASE COSTS, AND THAT THE DEVELOPER CARRIES ALL COSTS INCURRED WITH THIS PROJECT (A/E FEES, CONSTRUCTION LOAN INTEREST CHARGES, ETC.)

ALTERNATIVE V

PRESENT VALUE COST ANALYSIS 1990-2010

Constant Dollars

YEAR	LEASE/PURCHASE COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
0	25,100,000	4,341,731	3,669,317	1,061,565	3,583,000	
1	25,100,000	4,341,731	3,669,317	1,061,565		
2	25,100,000	4,341,731	3,669,317	1,061,565		
3	25,100,000	4,341,731	3,669,317	1,061,565		
4	25,100,000	4,341,731	3,669,317	1,061,565		
5	25,100,000	4,341,731	3,669,317	1,061,565		
6	25,100,000	4,341,731	3,669,317	1,061,565		
7	25,100,000	4,341,731	3,669,317	1,061,565		
8	25,100,000	4,341,731	3,669,317	1,061,565		
9	25,100,000	4,341,731	3,669,317	1,061,565		
10	25,100,000	4,341,731	3,669,317	1,061,565		
11	25,100,000	4,341,731	3,669,317	1,061,565		
12	25,100,000	4,341,731	3,669,317	1,061,565		
13	25,100,000	4,341,731	3,669,317	1,061,565		
14	25,100,000	4,341,731	3,669,317	1,061,565		
15	25,100,000	4,341,731	3,669,317	1,061,565		
16	25,100,000	4,341,731	3,669,317	1,061,565		
17	25,100,000	4,341,731	3,669,317	1,061,565		
18	25,100,000	4,341,731	3,669,317	1,061,565		
19	25,100,000	4,341,731	3,669,317	1,061,565		
20	25,100,000	4,341,731	3,669,317	1,061,565		*90,856,628
	502,000,000	86,835,220	73,386,340	21,231,300	3,583,000	90,856,628

*EVEN THOUGH IMPROVEMENTS COST IS HIGHER IN ALTERNATIVE 5 THAN IN ALTERNATIVE 3, THE SAME RESIDUAL VALUE HAS BEEN USED FOR BOTH SINCE THE ACTUAL VALUE OF THE BUILDINGS SHOULD BE THE SAME. ALTERNATIVE 5 HAS A HIGHER IMPROVEMENTS COST ONLY BECAUSE OF THE ASSOCIATED "SOFT COSTS" FOR MANAGEMENT AND CONSTRUCTION FINANCING.

Present Value - 7%

YEAR	7% DISCOUNT FACTOR	LEASE/PURCHASE COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
0	1.000						
1	.935	23,468,500	4,059,518	3,430,811	992,563	3,583,000	
2	.873	21,912,300	3,790,331	3,203,313	926,746		
3	.816	20,481,600	3,542,852	2,994,162	866,237		
4	.763	19,151,300	3,312,740	2,799,668	809,974		
5	.713	17,896,300	3,095,654	2,616,223	756,895		
6	.666	16,716,600	2,891,592	2,443,765	707,002		
7	.623	15,637,300	2,704,898	2,285,984	661,354		
8	.582	14,608,200	2,526,887	2,135,542	617,830		
9	.544	13,654,400	2,361,901	1,996,108	577,491		
10	.508	12,750,800	2,205,599	1,864,013	539,275		
11	.475	11,922,500	2,062,322	1,742,925	504,243		
12	.444	11,144,400	1,927,728	1,629,176	471,334		
13	.415	10,416,500	1,801,818	1,522,766	440,549		
14	.388	9,738,800	1,684,591	1,423,694	411,887		
15	.362	9,086,200	1,571,706	1,328,292	384,286		
16	.339	8,508,900	1,471,846	1,243,898	359,870		
17	.317	7,956,700	1,376,328	1,163,173	336,516		
18	.296	7,429,600	1,285,152	1,086,117	314,223		
19	.277	6,952,700	1,202,659	1,016,400	294,053		
20	.258	6,475,800	1,120,166	946,683	273,883		23,441,010
	TOTAL PRESENT VALUE	265,909,400	45,996,288	38,872,713	11,246,211	3,583,000	23,441,010

IV-49

Present Value - 10%

YEAR	10% DISCOUNT FACTOR	LEASE/PURCHASE COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
0	1.000					3,583,000	
1	.909	22,815,900	3,946,633	3,335,409	964,962		
2	.826	20,732,600	3,586,269	3,030,855	876,852		
3	.751	18,850,100	3,260,639	2,755,657	797,235		
4	.683	17,143,300	2,965,402	2,506,143	725,048		
5	.620	15,562,000	2,691,873	2,274,976	658,170		
6	.564	14,156,400	2,448,736	2,069,494	598,722		
7	.513	12,876,300	2,227,308	1,882,359	544,582		
8	.466	11,696,600	2,023,246	1,709,901	494,689		
9	.424	10,642,400	1,840,893	1,555,790	450,103		
10	.385	9,663,500	1,671,566	1,412,687	408,702		
11	.350	8,785,000	1,519,605	1,284,260	371,547		
12	.318	7,981,800	1,380,670	1,166,842	337,577		
13	.289	7,253,900	1,254,760	1,060,432	306,792		
14	.263	6,601,300	1,141,875	965,030	279,191		
15	.239	5,998,900	1,037,673	876,966	253,714		
16	.217	5,446,700	942,155	796,241	230,359		
17	.197	4,944,700	855,321	722,855	209,128		
18	.179	4,492,900	777,169	656,807	190,020		
19	.163	4,091,300	707,702	598,098	173,035		
20	.148	3,714,800	642,576	543,058	157,111		13,446,780
	TOTAL PRESENT VALUE	213,450,400	36,922,071	31,203,860	9,027,539	3,583,000	13,446,780

IV-51

ALTERNATIVE NO. 5A:

Have a new consolidated 958,119 gross square feet facility built, with all construction financing costs paid by EPA. In lieu of a lease/purchase arrangement, as in Alternative No. 5, EPA would obtain permanent financing directly to amortize the cost of the facility over a 20-year span.

Present Value Cost (With 7% Discount Factor)

ITEM	20 YEARS; 7%
Design and Construction Financing Costs . . .	28,962,985
Total Debt Service.	118,525,259
Utility Cost	45,996,288
Repairs, Maintenance and Improvements	38,872,733
Property Taxes and Insurance	11,246,211
Moving Costs	3,583,000
Subtotal	247,186,476
Less Residual Value	23,441,010
Total	223,745,466

Present Value Cost (With 10% Discount Factor)

ITEM	20 YEARS; 10%
Design and Construction Financing Cost. . . .	28,962,985
Total Debt Service.	99,538,033
Utility Cost	36,922,071
Repairs, Maintenance and Improvements	31,203,860
Property Taxes and Insurance	9,027,539
Moving Costs	3,583,000
Subtotal	209,237,488
Less Residual Value	13,446,780
Total	195,790,708

ALTERNATIVE NO. 5A:

ASSUMPTIONS:

1. EPA would pay all design costs and construction financing costs in this Alternative. These costs are assumed to be the same as in Alternative Nos. 4 and 5.

Construction Financing Cost..................	$22,000,000
A/E Design Fee..............................	$ 6,962,985
TOTAL	$28,962,985

This cost is indicated on the Present Value Cost Analysis as being paid in year "0".

2. Permanent financing costs for a $118,689,765 facility at a 14 percent fixed interest rate, amortized for 20-years: $17,718,000 per year. The 14 percent interest rate is an assumed rate based on the going rates in today's market. The actual rate, however, could vary significantly from this figure by 1990, depending on what the market is like by that date.

3. All other costs are indicated to be the same as Alternative No. 5.

4. The annual debt service is a fixed sum of $17,718,000 per year. To convert this sum to "Constant Dollars", Constant Dollar Price Deflator Factors have been used as indicated in the following chart:

YEAR	CURRENT DOLLAR PAYMENT		*CONSTANT DOLLAR PRICE DEFLATOR AT 6 PERCENT		CONSTANT DOLLAR PAYMENT
1	17,718,000	X	.94	=	16,654,920
2	17,718,000	X	.884	=	15,662,712
3	17,718,000	X	.831	=	14,723,658
4	17,718,000	X	.781	=	13,837,758
5	17,718,000	X	.734	=	13,005,012
6	17,718,000	X	.690	=	12,225,420
7	17,718,000	X	.648	=	11,481,264
8	17,718,000	X	.610	=	10,807,980
9	17,718,000	X	.573	=	10,152,414
10	17,718,000	X	.539	=	9,550,002
11	17,718,000	X	.506	=	8,965,308
12	17,718,000	X	.476	=	8,433,768
13	17,718,000	X	.447	=	7,919,946
14	17,718,000	X	.421	=	7,459,278
15	17,718,000	X	.395	=	6,998,610
16	17,718,000	X	.372	=	6,591,096
17	17,718,000	X	.349	=	6,183,582
18	17,718,000	X	.328	=	5,811,504
19	17,718,000	X	.309	=	5,474,862
20	17,718,000	X	.290	=	5,138,220

*Constant Dollar Price Deflator is obtained by using the Consumer Price Index (CPI) for 1984 divided by the CPI for 20-years ago (1964): 309.7 ÷ 92.7 = 3.34. According to compound interest tables, the rate which would yield 3.34 in 20-years is approximately 6 percent per year.

ALTERNATIVE VA

ACTUAL YEARLY OUTLAYS IN "REAL DOLLARS"

YEAR*	DESIGN AND CONSTRUCTION FINANCING COSTS	ANNUAL DEBT COSTS	UTILITY COSTS	REPAIRS, MAINTENANCE IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
1986	2,500,000 (A/E FEES)						
1987	2,500,000 (A/E FEES)						
1988	4,284,328 (A/E FEES AND CONSTRUCTION FINANCING COSTS)						
1989	8,024,328 (A/E FEES AND CONSTRUCTION FINANCING COSTS)						
1990	11,654,328 (A/E FEES AND CONSTRUCTION FINANCING COSTS)						
1991		17,718,000	4,341,731	3,669,317	1,061,565	3,583,000	
1992		17,718,000	4,602,234	3,889,476	1,125,258		
1993		17,718,000	4,878,368	4,122,844	1,192,774		
1994		17,718,000	5,171,071	4,370,215	1,264,340		
1995		17,718,000	5,481,335	4,910,373	1,340,201		
1996		17,718,000	5,810,215	5,204,996	1,420,613		
1997		17,718,000	6,158,828	5,517,296	1,505,850		
1998		17,718,000	6,528,358	5,848,333	1,596,201		
1999		17,718,000	6,920,059	6,199,233	1,691,973		
2000		17,718,000	7,335,263	6,571,187	1,793,491		
2001		17,718,000	7,775,378	6,965,459	1,901,101		
2002		17,718,000	8,241,901	7,383,386	2,015,167		
2003		17,718,000	8,736,415	7,826,389	2,136,077		
2004		17,718,000	9,260,600	8,295,973	2,264,241		
2005		17,718,000	9,816,236	8,793,731	2,400,096		
2006		17,718,000	10,405,210	9,321,355	2,544,102		
2007		17,718,000	11,029,523	9,880,636	2,696,748		
2008		17,718,000	11,691,295	10,473,475	2,858,553		
2009		17,718,000	12,392,772	11,101,883	3,030,066		
2010		17,718,000	13,136,339	11,767,996	3,211,870		
TOTAL YEARLY OUTLAYS	23,962,984	354,360,000	159,713,131	142,113,553	39,050,287	3,583,000	90,856,628

*EPA FISCAL YEARS

ALTERNATIVE V-A

PRESENT VALUE COST ANALYSIS 1990-2010

Constant Dollars

YEAR	DESIGN AND CONSTRUCTION FINANCING COSTS	ANNUAL DEBT SERVICE	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
0	28,962,985	28,962,985					
1		16,654,920	4,341,731	3,669,317	1,061,565	3,583,000	
2		15,662,712	4,341,731	3,669,317	1,061,565		
3		14,723,658	4,341,731	3,669,317	1,061,565		
4		13,837,758	4,341,731	3,669,317	1,061,565		
5		13,005,012	4,341,731	3,669,317	1,061,565		
6		12,225,420	4,341,731	3,669,317	1,061,565		
7		11,481,264	4,341,731	3,669,317	1,061,565		
8		10,807,980	4,341,731	3,669,317	1,061,565		
9		10,152,414	4,341,731	3,669,317	1,061,565		
10		9,550,002	4,341,731	3,669,317	1,061,565		
11		8,965,308	4,341,731	3,669,317	1,061,565		
12		8,433,768	4,341,731	3,669,317	1,061,565		
13		7,919,946	4,341,731	3,669,317	1,061,565		
14		7,459,287	4,341,731	3,669,317	1,061,565		
15		6,998,610	4,341,731	3,669,317	1,061,565		
16		6,591,096	4,341,731	3,669,317	1,061,565		
17		6,183,582	4,341,731	3,669,317	1,061,565		
18		5,811,504	4,341,731	3,669,317	1,061,565		
19		5,474,862	4,341,731	3,669,317	1,061,565		
20		5,138,220	4,341,731	3,669,317	1,061,565		*90,856,628
	28,962,985	196,963,314	86,834,620	73,386,340	21,231,300	3,583,000	90,856,628

Present Value -7%

YEAR	7% DISCOUNT FACTOR	DESIGN AND CONSTRUCTION FINANCING COSTS	ANNUAL DEBT SERVICE	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
0	1.000	28,962,985					3,583,000	
1	.935		15,572,350	4,059,518	3,430,811	992,563		
2	.873		13,673,547	3,790,331	3,203,313	926,746		
3	.816		12,014,504	3,542,852	2,994,162	866,237		
4	.763		10,558,209	3,312,740	2,799,668	809,974		
5	.713		9,272,573	3,095,654	2,616,223	756,895		
6	.666		8,142,129	2,891,592	2,443,765	707,002		
7	.623		7,152,827	2,704,898	2,285,984	661,354		
8	.582		6,290,244	2,526,887	2,135,542	617,830		
9	.544		5,522,913	2,361,901	1,996,108	577,491		
10	.508		4,851,401	2,205,599	1,864,013	539,275		
11	.475		4,258,521	2,062,322	1,742,925	504,243		
12	.444		3,744,592	1,927,728	1,629,176	471,334		
13	.415		3,286,777	1,801,818	1,522,766	440,549		
14	.388		2,894,199	1,684,591	1,423,694	411,887		
15	.362		2,533,496	1,571,706	1,328,292	384,286		
16	.339		2,234,381	1,471,846	1,243,898	359,870		
17	.317		1,960,195	1,376,328	1,163,173	336,516		
18	.296		1,720,205	1,285,152	1,086,117	314,223		
19	.277		1,516,536	1,202,659	1,016,400	294,053		
20	.258		1,325,660	1,120,166	946,683	273,883		23,441,010
	TOTAL PRESENT VALUE	28,962,985	118,525,259	45,996,288	38,872,713	11,246,211	3,583,000	23,441,010

Present Value -10%

YEAR	10% DISCOUNT FACTOR	DESIGN AND CONSTRUCTION FINANCING COSTS	ANNUAL DEBT SERVICE	UTILITY COSTS	REPAIRS, MAINTENANCE AND IMPROVEMENTS	PROPERTY TAXES AND INSURANCE	MOVING COSTS	RESIDUAL VALUE
0	1.000	28,962,985					3,583,000	
1	.909		15,139,322	3,946,633	3,335,409	964,962		
2	.826		12,937,400	3,586,269	3,030,855	876,852		
3	.751		11,057,467	3,260,639	2,755,657	797,235		
4	.683		9,451,188	2,965,402	2,506,143	725,048		
5	.620		8,063,107	2,691,873	2,274,976	658,170		
6	.564		6,895,136	2,448,736	2,069,494	598,722		
7	.513		5,889,888	2,227,308	1,882,359	544,582		
8	.466		5,036,518	2,023,246	1,709,901	494,689		
9	.424		4,304,623	1,840,893	1,555,790	450,103		
10	.385.		3,676,750	1,671,566	1,412,687	408,702		
11	.350		3,137,857	1,519,605	1,284,260	371,547		
12	.318		2,681,938	1,380,670	1,166,842	337,577		
13	.289		2,288,864	1,254,760	1,060,432	306,792		
14	.263		1,961,790	1,141,875	965,030	279,191		
15	.239		1,672,667	1,037,673	876,966	253,714		
16	.217		1,430,267	942,155	796,241	230,359		
17	.197		1,218,165	855,321	722,855	209,128		
18	.179		1,042,228	777,169	656,807	190,020		
19	.163		892,402	707,702	598,098	173,035		
20	.148		760,456	642,576	543,058	157,111		13,446,780
	TOTAL PRESENT VALUE	28,962,985	99,538,033	36,922,071	31,203,860	9,027,539	3,583,000	13,446,780